

**PROJECT MANUAL**

**New Competition Gym and Classroom Addition**

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for

**FORT PAYNE CITY SCHOOLS**

FORT PAYNE HIGH SCHOOL - FORT PAYNE, ALABAMA

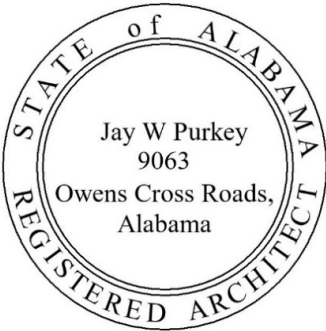
FINAL DCM SUBMITTAL - October 10, 2024

Prepared By



Goodwyn Mills Cawood, LLC.  
117 Jefferson Street North  
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**GMC PROJECT NUMBER:** AHUN230005



11/14/2024

A handwritten signature in blue ink, appearing to read "JPurkey", written over a vertical line.

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**SECTION 00 0101  
PROJECT TITLE PAGE**

**PROJECT MANUAL**

**FOR**

**FORTY PAYNE HIGH SCHOOL COMPETITION GYM AND CLASSROOM ADDITION**

**ARCHITECT'S PROJECT NUMBER: AHUN230010**

**FORT PAYNE CITY SCHOOLS**

**205 45TH STREET NE**

**FORT PAYNE, ALABAMA 35967**

**DATE: 10-18-2024**

**PREPARED BY:**

**GOODWYN MILLS CAWOOD, LLC**

**END OF SECTION**

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**SECTION 00 0103  
PROJECT DIRECTORY**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Identification of project team members and their contact information.

**102 OWNER:**

- A. Name: Forty Payne City Schools
1. Address Line 1: 205 45th Street NE.
  2. City: Fort Payne.
  3. State: AL.
  4. Zip Code: 36967.
  5. Telephone: 256-845-0915.
- B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
1. Title: Superintendent.
  2. Name: Brian Jett.
  3. Email: bjett@fpcsk12.com.

**103 CONSULTANTS:**

- A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
1. Company Name: GMC LLC..
    - a. Address Line 1: 117 Jefferson St. North.
    - b. Address Line 2: \_\_\_\_\_.
    - c. City: Huntsville.
    - d. State: AL.
    - e. Zip Code: 35801.
    - f. Telephone: 256-539-3431.
  2. Primary Contact:
    - a. Title: Project Manger.
    - b. Name: Jay W. Purkey, AIA NCARB.
    - c. Email: jay.purkey@gmcnetwork.com.
- B. Civil Engineering Consultant:
1. Company Name: GMC, LLC..
    - a. Address Line 1: 2400 5th Ave South, Suite 200.
    - b. City: Birmingham.
    - c. State: AL.
    - d. Zip Code: 35223.
    - e. Telephone: 205-879-4462.
  2. Primary Contact:
    - a. Title: Civil Engineer.
    - b. Name: Corey Shoop, PE.
- C. Landscape Architecture Consultant:
1. Company Name: GMC, LLC..
    - a. Address Line 1: 2400 5th Ave..



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- b. Address Line 2: 200.
  - c. City: Birmingham.
  - d. State: AL.
  - e. Zip Code: 35233.
  - f. Telephone: 205-879-4462.
  - 2. Primary Contact:
    - a. Title: Landscape Architect.
    - b. Name: Amanda Fonte.
  - D. Structural Engineering Consultant:
    - 1. Company Name: 200 Chase Park South, Suite 125.
      - a. Address Line 1: 3300 Cahaba Road.
      - b. Address Line 2: Suite 210.
      - c. City: Hoover.
      - d. State: AL.
      - e. Zip Code: 35244.
      - f. Telephone: 205-824-5200.
    - 2. Primary Contact:
      - a. Title: Principal.
      - b. Name: Craig Winn, PE.
  - E. Mechanical Engineering Consultant - HVAC & Plumbing / Electrical Engineering Consultant:
    - 1. Company Name: Rocket MEP.
      - a. Address Line 1:
      - b. City: Huntsville.
      - c. State: AL.
      - d. Zip Code: 35801.
    - 2. Primary Contact:
      - a. Name: Josh Meharg, PE.

**104 CONSTRUCTION MANAGER:**

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**END OF SECTION**

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**END OF SECTION**

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**SECTION 00 3100  
AVAILABLE PROJECT INFORMATION**

**PART 1 GENERAL**

**3.01 EXISTING CONDITIONS**

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

1. Site and Utility Survey: The site survey of existing conditions of the site is included in the Civil drawings.
2. Geotechnical Report: The Geotechnical Report is included in these Specifications following this Section.

**3.02 PERMITS**

A. The General Contractor is responsible for obtaining and paying for all permits required by the Contract Documents and by law associated with the project, including but not limited to Permit Fees, Plan Review Fees, Inspection Fees, and administrative Fees levied by the AHJ or other government agencies with authority over the project.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**5.01 OBTAINMENT OF PERMITS**

A. Building Permit Procedures: Where Building Permit(s) are required by law, the General Contractor shall:

1. Complete and file permit application(s) with appropriate agency.
  - a. Submit application within five days of the Notice to Proceed.
2. Pay required fees.
3. Advise Architect if submission of modified documents is necessary to have the authorities having jurisdiction complete the plan review and approval process. Submit modified documents expeditiously.
4. Do not commence execution of any item of work for which a permit has not been obtained.

**END OF SECTION**

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**PREPARATION AND APPROVAL OF  
CONSTRUCTION  
CONTRACTS and BONDS  
SUBMITTED ELECTRONICALLY**

**CHECKLIST**

Use with DCM Forms C-5, C-6, & C-7  
and DCM Forms 9-A, 9-B, & 9-C

<b>CONSTRUCTION CONTRACT - DCM Form C-5 or DCM Form 9-A (PSCA Projects)</b>	
The numbers in the left column below correspond to numbers in the left margin of the Contract form.	
(1)	<b>PROJECT NUMBER(S):</b> DCM will insert the DCM Project Number in the field provided. <ul style="list-style-type: none"> <li>On DCM Form 9-A, insert the PSCA Project Number in the field provided.</li> </ul>
(2)	<b>DATE:</b> Do not select a date beyond today's date.
(3)	<b>OWNER:</b> Insert the full, legal name, address, email, and telephone number of the Owner (Awarding Authority). <ul style="list-style-type: none"> <li>On DCM Form 9-A, insert the name, address, email, and telephone number of the Local Owner (city or county school board, college, university, etc.) after "Alabama Public School and College Authority"</li> </ul>
(4)	<b>CONTRACTOR:</b> Insert the Contractor's company name, correct mailing address, email, and telephone number. For State Agency projects, the Contractor Company name and address must match the name and address registered in the State of Alabama Accounting and Resource System (STAARS) or AL Buys (if registered), used by most State Agencies to pay Vendors. The Contractor Company name and address must be consistent across all documents in the same contract package, in order to avoid Comptroller's Office rejection. <ul style="list-style-type: none"> <li>On DCM Form 9-A: The Contractor Company name and address must match the name and address registered in STAARS or AL Buys used by the State to pay Vendors. The Contractor Company name and address must be consistent across all documents in the same contract package, in order to avoid Comptroller's rejection.</li> </ul>
(5)	<b>The WORK:</b> Insert the complete name of the Project; same as in the Bid Documents.
(6)	<b>CONTRACT DOCUMENTS:</b> Insert the date of the Bid Documents
(7)	<b>ADDENDA:</b> Identify, by number and date, all pre-bid Addenda that were issued to the Bid Documents. If none were issued, insert "None". All Addenda shall be submitted to DCM for review prior to contract issuance.
(8)	<b>ARCHITECT:</b> Insert the full, legal name, address, email, and telephone number of the Project Architectural or Engineering firm.
(9)	<b>CONTRACT SUM:</b> The Contract Sum is the total of the Contract's Base Bid and accepted Bid Alternate Prices, if any. Insert the Contract Sum in words and figures, verifying that this amount corresponds with the CERTIFIED TABULATION OF BIDS.
(10)	<b>BID ALTERNATE PRICES:</b> Identify which, if any, Bid Alternate Prices are accepted and included in the Contract Sum by inserting either (a) "No Alternate Prices Requested in Bid", (b) "No Alternate Prices Accepted", or (c) a listing of the accepted Alternates by number and dollar amount.
(11)	<b>The CONTRACT TIME:</b> State the Contract Time in words and in figures.
(12)	<b>LIQUIDATED DAMAGES:</b> If the Owner has computed a daily rate for liquidated damages, insert the amount in both words and figures in the spaces provided.
(13)	<b>SPECIAL PROVISIONS:</b> This space may be used to incorporate Special Provisions into the Contract, such as unit prices, compliance with enacted provisions, and value engineering. If the solicitation for bids required Unit Prices, insert a statement of which Unit Prices, if any, are accepted and incorporated into the Contract. If more space is needed, Special Provisions may be stated on an attachment that is cited in the Special Provisions section. <ul style="list-style-type: none"> <li>DCM Form 9-A is published bearing Special Provision "A. Severable Payments", which is where the portions of the Contract Sum to be paid by the PSCA and the Local Owner are to be stated. Obtain these amounts from Local Owner and insert them in the spaces provided. Other Special Provisions, such as disposition of Unit Prices, may be inserted below this provision.</li> </ul>
(14)	<b>STATE GENERAL CONTRACTOR'S LICENSE:</b> Insert the Contractor's current state general contracting license number, bid limit, and classification in the spaces provided.



<b>(15)</b>	<b>SIGNATURES - APPROVING and CONTRACTING PARTIES</b> The documents will forward to the signers in sequential order.
<p style="text-align: center;"><b>PERFORMANCE BOND, DCM Form C-6 or DCM Form 9-B (PSCA Projects), and PAYMENT BOND, DCM Form C-7 or DCM Form 9-C (PSCA Projects)</b></p> <p>Required for contracts of \$100,000.0 or more, with surety’s power-of-attorney - required per Section 39-2-8 of the Code of Alabama.</p>	
<b>(1)</b>	<b>SURETY’S BOND NUMBER</b> should be inserted in the field provided.
<b>(2)</b>	<b>PRINCIPAL:</b> Contractor’s name and address is to be the same as appears in the Construction Contract.
<b>(3)</b>	<b>SURETY:</b> The full, legal name and address of the bonding company.
<b>(4)</b>	<b>OWNER:</b> The Owner’s name and address is to be the same as appears in the Construction Contract.
<b>(5)</b>	<b>PENAL SUM:</b> The Penal Sum of each Bond is to be the Contract Sum of the Construction Contract and is to be inserted in both words and figures.
<b>(6)</b>	The <b>Date</b> of the Construction Contract: The date that appears on the Construction Contract.
<b>(7)</b>	The <b>PROJECT:</b> The same name or description as appears in the Construction Contract.
<b>(8)</b>	<b>DATE:</b> After “SIGNED AND SEALED” is to appear the date upon which Surety signs the Bond. <b>THIS DATE CANNOT PRECEDE THE DATE OF THE CONSTRUCTION CONTRACT.</b>
<b>(9)</b>	<b>CONTRACTOR’S SIGNATURE:</b> The Contractor’s name must appear beneath “CONTRACTOR”, under which the signature of a member or officer of the firm must appear with the name and title of the signing party appearing beneath the signature.
<b>(10)</b>	<b>SURETY’S SIGNATURE:</b> The full, legal name of the bonding company must appear under “SURETY”, under which the signature of an individual having power of attorney for the bonding company must appear with the individual’s name and title appearing beneath the signature.
<b>(11)</b>	<b>ATTACHED POWER OF ATTORNEY:</b> Attached to each of the Bonds must be a Power of Attorney, signed by an officer of the bonding company, for the individual e-signing the bond on behalf of the bonding company. <b>The date of the Power of Attorney <u>must</u> not precede the date of the bond.</b>

**ATTACHMENTS**

The following documents must be attached to the Construction Contract:

- Insurance Certificate (attach copy): It is the responsibility of the design professional to ensure all insurance requirements are discussed with bidders prior to a bid and that Contractor has provided the requirements to their insurance provider. Contractor must obtain all insurance coverage specified in Article 37 of the General Conditions of the Contract - required per Section 39-2-8 of the Code of Alabama.
- Surety’s power-of-attorney: Required for Performance Bond, which is required for contracts of \$100,000.00 or more per Section 39-2-8 of the Code of Alabama.
- Surety’s power-of-attorney: Required for Payment Bond, which is required for contracts of \$100,000.00 or more per Section 39-2-8 of the Code of Alabama.
- Certified Tabulation of Bids (attach copy): Required for all projects including those with informal bids -required per Section 39-2-6 of the Code of Alabama.
- DCM Form C-3: Proposal Form (attach copy): If bid proposal was adjusted by notation on outside of envelope, also attach copy of outside of envelope including notation.
- DCM Form C-3A: Accounting of Sales Tax (attach copy): Attachment must be of the executed C-3A from the bid -required per Section 40-9-14.1 of the Code of Alabama.
- E-Verify Memorandum of Understanding (attach copy): Entire document required - required per Section 31-13-25(b) of the Code of Alabama.
- Alabama Vendor Disclosure Statement - required per Section 41-16-82 of the Code of Alabama. Contractor must mail one original completed wet-signed notarized and dated hardcopy to DCM along with DCM Form: Transmittal of Alabama Vendor Disclosure Statement. DCM will perform a review, and if the document is correct, will attach a scan of the Disclosure Statement to the Contract.

## DCM USER FEES:

- **PSCA-Funded Projects & Fully Locally-Funded State Agency Projects:** The Contract Document Administration Fee-CC and the Permit Fee must be paid by the time a Construction Contract for a PSCA-funded project or state agency/authority project is submitted to DCM for review, or when a fully locally-funded project Construction Contract is converted to PSCA. Contract reviews can begin once the fees have been paid.
- **Fully Locally-Funded K-12 Projects:** The Permit Fee must be paid by the time a copy of a fully locally-funded K-12 school project's executed Construction Contract is received at DCM's office from the State Department of Education (SDE). \* See Permit Fee exception below.

- **General Information:**

Basic Contract Document Administration (CDA) Fee: This fee covers review of the Agreement Between Owner and Architect (O/A Agreement) and Construction Contract for state agency projects, and partially or fully PSCA-funded projects of K-12 public schools and universities and the related amendments, change orders, service invoices and pay requests. This fee does not apply to fully locally-funded K-12 public school projects or fully locally-funded university projects. The Basic CDA Fee covers review of the original submitted document and one revision. The total basic CDA fee is 1/2 of 1% of the total construction cost, due in two parts: 1/4 of 1% (.25%) of the Project Budget for administration of the O/ A Agreement. 1/4 of 1% (.25%) of the Construction Contract Amount for administration of the Construction Contract. The CDA Fee for a PSCA-funded O/A Agreement or Construction Contract is limited by the Project Construction Cost funded by PSCA.

Additional Revised Contract Document Fee: When more than one revision of a Construction Contract is required, an additional fee of \$200.00 will be charged to the design professional for each additional submittal until the document is executed.

Basic Permit Fee: This fee covers required project inspections. The Permit Fee **must be paid before a construction contract is reviewed by DCM, or** becomes due when a self-performance letter **or fully locally-funded K-12 construction contract** is received by DCM, and must be paid before a Pre-Construction Conference is scheduled with DCM Inspectors\*

Note: Although DCM does not review the construction contracts of fully locally-funded public K-12 projects, the Permit Fee must be paid before the required Pre-Construction Conference is scheduled with DCM Inspectors for such projects.\*

\* Exception: Permit Fees are not owed for fully locally-funded public K-12 projects with an estimated cost of \$750,000.00 or Less for capital improvement or alterations, additions, repair, or maintenance of heating, ventilation, and air conditioning systems or any alterations, additions, repair, or maintenance of a roof; all such projects are still subject to DCM pre-construction conferences and inspections.

- ⊞ Determination of whether or not a project is in the \$750,000.00 or Less classification for Permit Fees is based on the cost of the entire project including all phases and bid packages. If total of bids received for all phases and bid packages exceeds \$750,000.00 for a fully locally-funded public K-12 project, then a Permit Fee is owed.

Fees May Be Paid online at [www.dcm.alabama.gov](http://www.dcm.alabama.gov) or paid with a physical check. Make check payable to: "Finance - Construction Management", include the DCM (BC) Project #, if assigned, on the check and attach the CDA Fees Calculation Worksheet and/or the Permit Fees Calculation Worksheet (also available on [www.dcm.alabama.gov](http://www.dcm.alabama.gov)). Mail payment to: Finance - Construction Management, P.O. Box 301150, Montgomery, AL 36130-1150. For payments using Public School and College Authority (PSCA) funds and for state agency inter-fund transfers: contact Jennie Jones at 334-242-4808 or [jennie.jones@realproperty.alabama.gov](mailto:jennie.jones@realproperty.alabama.gov).

# PRE-CONSTRUCTION CONFERENCE CHECKLIST

The following are recommended topics to be covered during the required Pre-Construction Conference. Contact the DCM Project Inspector [via DCM's Engage Portal](#) at least fourteen (14) days prior to scheduling the conference.

*\*Shall be discussed while owner is present*

	*1. Name and relationship to job of local Owner personnel
	2. Public officials involved
	3. Names of architect/engineer personnel involved
	4. Provide e-mail addresses on Pre-Construction Sign-in sheet
	5. Construction sets of plans available to contractor
	6. Verify alternates accepted, etc.
	7. Approved list of sub-contractors
	*8. Point of contact for project. Project Manager _____ Job Superintendent _____
	9. Approved cost breakdown (DCM Form C-10SOV) & Progress Schedule (DCM Form C-11)
	*10. Method of approving monthly payment requests <ul style="list-style-type: none"> <li>• All State Agency, PSCA-funded University, and PSCA-funded K-12 projects: payment applications must be submitted via DocuSign PowerForm links available from <a href="#">DCM's Engage Portal</a>.</li> <li>• Fully locally-funded University and fully locally-funded K-12 projects: submit payment applications per Owner requirements.</li> </ul>
	*11. Time Extensions
	*12. Overall phasing of job
	13. Project limits
	14. Shop drawings, time to process
	*15. Sales tax savings (Alabama Department of Revenue)
	*16. Project sign and other job signs
	17. ADEM permit, if more than one acre of land is disturbed. <ul style="list-style-type: none"> <li>• Coordinate offsite storm water drainage with the authority having jurisdiction when applicable.</li> </ul>
	18. DCM Inspection Minimum Requirements.
	19. Advance notice for required DCM inspections The contractor will notify the architect by email of the date the project will be ready for an inspection by the Division of Construction Management. Inspections must be requested <a href="#">via DCM's Engage Portal</a> 14 days in advance. When the DCM Inspector confirms the inspection date and time, the architect will send an email confirming the inspection date and time to all parties as well as a copy to <a href="mailto:inspections@rpm.alabama.gov">inspections@rpm.alabama.gov</a> . An Outlook calendar invite is also suggested for all inspections. Cancellations of any scheduled inspection must be received in writing no later than 48 hours prior to the scheduled inspection. If the inspection is canceled, it will be rescheduled subject to the DCM Inspector's availability. Cancellations received less than 48 hours in advance shall incur a \$1,500.00 re-inspection fee. If the project is not ready for the scheduled inspection, the General Contractor shall incur a \$1,500.00 re-inspection fee.

<p>20. <u>Pre-Construction Conference</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Major Subs</p> <ul style="list-style-type: none"><li>• Fully-executed construction contract and Notice to Proceed</li><li>• Verification of permit fee payment (Exception: fully locally-funded K-12 &amp; public four-year University capital improvement, HVAC, or roof projects with an estimated cost of \$750,000.00 or Less, are exempt from DCM Fees.)</li><li>• Fire alarm contractor and fire sprinkler contractor certification (from State Fire Marshal)</li><li>• ADEM permit, if more than one acre of land is disturbed.</li><li>• The General Contractor to perform and furnish all work, labor, services, supervision, materials, equipment, tools, scaffolds, appliances, insurance, taxes, and other things necessary to complete the work in strict accordance with all plans, specifications, and GENERAL CONDITIONS. The Contractor shall be liable for any omissions in contractors bid proposal or any other interpretations made by contractor. All items of Work related to each are to be provided so that no gaps, omissions, or conflicts arise that prevents a complete and functioning result.</li><li>• Contractor's duty to coordinate work of separate contractors.</li></ul>
<p>21. <u>Pre-Construction Conference for Storm Shelter</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Structural Engineer, Major Subs, Special Inspections Representative</p> <ul style="list-style-type: none"><li>• The completed &amp; signed DCM Form B-15: Owner's Statement of Responsibility for Tornado Storm Shelter (Hurricane Shelter Where Applicable) must be submitted to the DCM Inspector at Pre-Construction Conference. Must be kept with Owner's storm shelter records.</li><li>• The completed &amp; signed DCM Form C-17: Contractor's Statement of Responsibility for Construction of Tornado Storm Shelter (Hurricane Shelter Where Applicable) along with required Quality Assurance Plan (QAP) must be submitted to DCM Inspector at Pre-Construction Conference.</li><li>• The completed and signed DCM Form B-14: Certification of Structural Observations from the Structural Engineer of Record must be attached to the Certificate of Substantial Completion form via DocuSign link available from <a href="#">DCM's Engage Portal</a>.</li><li>• Storm Shelter Impact-protective systems Listing and labeling: Impact-protective systems shall be listed and labeled. Marking: The following function and performance characteristics shall be provided on the label for each impact protective system tested:<ol style="list-style-type: none"><li>1. Manufacturer's identification reference or listing number for the assembly.</li><li>2. Type of impact-protective system, such as window assembly, door assembly shutter assembly or louver.</li><li>3. Hazard: hurricane, tornado, or both.</li><li>4. Missile weight and speed.</li><li>5. Design wind pressure.</li><li>6. Edition of ICC 500.</li></ol></li></ul>
<p>22. <u>Pre-Roofing Conference</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Roofing Sub, Roofing Manufacturer's Representative</p> <ul style="list-style-type: none"><li>• This conference shall be conducted by the design professional as described in Chapter 5, Section C.4 of the DCM Manual of Procedures.</li><li>• Roofing submittals must be approved by the architect prior to pre-roofing conference.</li><li>• Roofing manufacturer must provide documentation that roof design and roofing materials meet code requirements for wind uplift and impact resistance.</li><li>• Copy of sample roof warranty – Note: Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.</li><li>• Contractor shall video existing building interior and exterior prior to roofing operations and provide copy to owner.</li><li>• General Contractor's Roofing Guarantee and Manufacturer's Roofing Warrantees must be presented to DCM Inspector at Final Inspection and submitted with Certificate of Substantial Completion for all projects via DocuSign PowerForm links available from <a href="#">DCM's Engage Portal</a>.</li></ul>

	<p>23. <u>Above Ceiling Inspections</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, MEP Engineers, Major Subs</p> <ul style="list-style-type: none"> <li>• All work must be completed except for installation of ceiling tiles, and/or hard ceilings.</li> <li>• Space must be conditioned.</li> <li>• Permanent power must be connected unless otherwise arranged with the DCM Inspector.</li> <li>• Grease duct must be inspected and approved by the DCM Inspector prior to fire wrapping and above-ceiling inspection.</li> </ul>
	<p>24. <u>Life Safety Inspections and Final Inspection</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Engineers, Major Subs, Local Fire Marshal</p> <ul style="list-style-type: none"> <li>• Fire alarm certification</li> <li>• Kitchen hood fire suppression system certification</li> <li>• General contractor's 5-year roofing guarantee (DCM Form C-9)</li> <li>• Roofing manufacturer's warranty</li> <li>• Above ground and below ground sprinkler certifications</li> <li>• Completed certificate of structural engineer's observations (for storm shelter)</li> <li>• Emergency and exit lighting tests.</li> <li>• Fire alarm must be monitored.</li> <li>• Elevator inspection completed and certificate of operation provided by the State of Alabama Department of Labor</li> <li>• Boiler/vessels inspection completed, and certificate of operation provided by the State of Alabama Department of Labor</li> <li>• Pressure test/Flush test for underground sprinkler lines (witnessed by local fire marshal, fire chief and/or DCM Inspector)</li> <li>• Flush/pressure test for new and/or existing fire hydrants</li> <li>• Must have clear egress/access and emergency (for first responders) access to building</li> <li>• Must have ADA access completed.</li> <li>• Comply with ADA requirements: plumbing fixture heights, toilet partition widths, turnaround, signage, parking lot striping and signage, etc.</li> <li>• Emergency Responder Radio Coverage</li> </ul>
	<p>25. <u>Year-End Inspection</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Engineers and/or Major Subs may be required.</p> <ul style="list-style-type: none"> <li>• Owner's list of documented warranty items</li> <li>• Reconciliation of user fees with DCM shall be completed prior to inspection</li> </ul>
	<p>26. Other inspections required before work is covered</p>
	<p>27. Third-party inspections/special inspections. Structural components, Roofing, Geotechnical, Commissioning, lab tests, etc.</p>
	<p>28. Procedure if bad soil or rock is encountered: Geotech and special inspections</p>
	<p>29. Inspection report distribution – weekly per Owner-Architect Agreement. All site inspections and observations are to be recorded <b>and transmitted to the DCM Inspector via DCM's Engage Portal</b>. The design professional must also concisely report any deficiencies encountered, problems or questions raised by the contractor, instructions or answers given to the contractor, and administrative or construction delays observed. The design professional must endeavor to write his or her reports utilizing descriptions of components and areas that are consistent with descriptions contained in the plans and specifications so that the "third-party reader" can understand what is being discussed and where it is located in the project. Photographs may be included for clarity. Keep photos to a minimum. Each report shall also be distributed by the design professional to the Owner and contractor promptly after conducting an inspection so that all parties are kept current regarding events on the project.</p>
	<p>30. Ready mix plant, file delivery tickets, slump tests, cylinders. Quality of concrete work; concrete testing</p>
	<p>31. Light gauge metal roof framing and/or wood truss framing to be inspected by the structural engineer.</p>



	32. Record Drawings and As-Built Drawings: Contractor will maintain a set of drawings designated solely for As-Built Drawings to satisfy its closeout requirements. Contractor/Subcontractor shall, on a weekly basis, record all changes, revisions, modifications, additions, etc. to accurately reflect its completed work.
	33. Protection Of the Work: The General Contractor shall carefully secure and protect the work and all materials, equipment, or work of Sub-Contractors and others in the vicinity of the work and shall be liable for any loss or damage that results from Contractor`s failure to do so.
	*34. Use of site and existing building, access drive, signs
	*35. Conduct of contractor`s personnel: No interaction with staff and/or students. No foul language, no smoking or use of tobacco products, no drugs, and no firearms on school property.
	*36. Use of existing toilets
	*37. Coordinate any utilities supplied by Owner
	*38. Coordinate outages and work in existing building with Owner
	*39. Keeping existing exit paths open
	*40. Routine job clean-up to be perform daily. Clean-up areas where work is performed including paths of access/egress utilized by Contractor`s personnel and equipment. All generated waste and debris will be placed in dumpsters or other containment boxes.
	41. O.S.H.A. - Report all accidents - safety General Contractor's responsibility
	42. Contractor is reminded of obligation to comply with the Alabama Child Labor Law and E-Verify
	43. Building location relative to critical property line, easement, setback, etc.
	44. Surveyor to check foundation wall if location critical
	45. Verify sanitary outfall before committing floor level
	46. Procedure if bad soil or rock is encountered: Geotech and special inspections
	47. Stockpiling topsoil
	48. Protecting trees
	49. Soil Treatment, mix on site in presence of Job Superintendent
	50. What is expected of masonry work, mortar additive
	51. Problems with hollow metal - install proper fire labels
	52. Potential conflict of mechanical and electrical equipment; shop drawings
	53. Return air plenums (no combustibles)
	54. Fire damper installation issues
	55. Kraft-faced insulation is not to be installed exposed.
	56. Coordinate with local fire authority to assure access to the building for firefighting equipment during construction and before final acceptance. Provide fire extinguishers as required.
	57. Comply with fire hydrant requirement; coordinate with local Fire Authority or State Fire Marshal.
	*58. Certificate of Substantial Completion/Final Inspection All projects: Certificate must be activated via DocuSign link after final inspection and receipt of DCM Inspector`s report. The correct DocuSign link is available from <b>DCM's Engage Portal</b> .
	59. Release of retainage – 30 days to complete punch list and closeout
	*60. Project Closeout - precedes Final Payment <ul style="list-style-type: none"> <li>a. Warranties</li> <li>b. Operating and Maintenance Manuals</li> <li>c. As-built Drawings</li> <li>d. Other requirements</li> </ul>

- |  |  |
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|  | <p>61. Advertisement of Completion - start ad after substantial completion</p> <ol style="list-style-type: none"><li>a. for projects less than \$100,000.00, Advertisement of Completion is not required.</li><li>b. for projects \$100,000.00 or more, Contractor advertises for 3 weeks. The contractor can publish a notice using one or more of the following methods:<ul style="list-style-type: none"><li>• In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.</li><li>• On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.</li><li>• On a website utilized by the awarding authority for publishing notices.</li><li>• If no newspaper is published in the county in which the work was done, and if the awarding authority does not utilize a website for the purpose of publishing notices, the notice may be given by posting at the courthouse for 30 days, and proof of the posting of the notice shall be given by the awarding authority and the contractor.</li></ul></li></ol> |
|--|--|

TO: **Alabama Department of Finance**  
**Real Property Management**  
**Division of Construction Management**  
 770 Washington Avenue, Suite 444  
 Montgomery, Alabama 36104  
 (334) 242-4082 FAX (334) 242-4182

# CHANGE ORDER JUSTIFICATION

Change Order No. \_\_\_\_\_

Date: \_\_\_\_\_

DCM (BC) No. \_\_\_\_\_

*Purpose and instructions on next page.  
Do not staple this form and/or attachments; use clips.*

<b>(A)</b>	PROJECT NAME & LOCATION:	OWNER ENTITY NAME & ADDRESS:						
	CONTRACTOR COMPANY NAME & ADDRESS:	ARCHITECTURAL / ENGINEERING FIRM NAME & ADDRESS:						
<b>(B)</b>	DESCRIPTION OF PROPOSED CHANGE(S): <b>ATTACH CONTRACTOR'S DETAILED COST PROPOSAL(s)</b>							
	AMOUNT: <input type="checkbox"/> ADD <input type="checkbox"/> DEDUCT \$ _____ TIME EXTENSION: _____ CALENDAR DAYS							
<b>(C)</b>	<table style="width:100%; border: none;"> <tr> <td style="width:33%;">ORIGINAL CONTRACT AMOUNT</td> <td style="width:33%;">PREVIOUS C.O.'s _____ THRU _____</td> <td style="width:34%; text-align: right;">CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER</td> </tr> <tr> <td>\$ _____</td> <td>+ \$ _____</td> <td style="text-align: right;">= \$ _____</td> </tr> </table>		ORIGINAL CONTRACT AMOUNT	PREVIOUS C.O.'s _____ THRU _____	CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER	\$ _____	+ \$ _____	= \$ _____
ORIGINAL CONTRACT AMOUNT	PREVIOUS C.O.'s _____ THRU _____	CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER						
\$ _____	+ \$ _____	= \$ _____						
<b>(D)</b>	JUSTIFICATION FOR NEED OF CHANGE(S):							
<b>(E)</b>	JUSTIFICATION OF CHANGE ORDER vs. COMPETITIVE BID:							
<b>(F)</b>	ARCHITECT   ENGINEER'S EVALUATION OF PROPOSED COST:							
<b>(G)</b>	<p style="text-align: center;"><b>CHANGE ORDER RECOMMENDED</b></p> <hr/> <p style="text-align: center;">ARCHITECTURAL / ENGINEERING FIRM NAME</p> <p>By: _____ ARCHITECT / ENGINEER'S SIGNATURE</p> <p>By: _____ OWNER'S PROJECT REPRESENTATIVE'S SIGNATURE</p>	<p style="text-align: center;"><b>CHANGE ORDER JUSTIFIED AND APPROVED</b></p> <hr/> <p style="text-align: center;">LOCAL OWNER ENTITY NAME</p> <p>By: _____ OWNER'S SIGNATURE</p> <p>By: _____ OWNER'S LEGAL COUNSEL'S SIGNATURE</p>						



## CHANGE ORDER JUSTIFICATION: PURPOSE and INSTRUCTIONS

### **PURPOSE**

The awarding of work through an existing contract may potentially conflict with, or violate, the "Competitive Bid Laws" of the State of Alabama. **The determination of legality of Change Orders rests with the Awarding Authority and its legal advisor.** In a June 15, 1979, Opinion, the Office of the Attorney General offered guidelines for making such determinations in conjunction with considering the facts and merits of each situation. The purpose of the CHANGE ORDER JUSTIFICATION is to provide a means through which the Awarding Authority considers these guidelines and the intent of the "Competitive Bid Laws" when authorizing Change Orders. Pursuant to these guidelines, the following types of changes meet the criteria for awarding work through Change Orders in lieu of through the Competitive Bid process:

- I. Minor Changes for a monetary value less than required for competitive bidding.
- II. Changes for matters relatively minor and incidental to the original contract necessitated by unforeseeable circumstances arising during the course of the work.
- III. Emergencies arising during the course of the work of the contract.
- IV. Bid alternates provided for in the original bidding where there is no difference in price of the change order from the original best bid on the alternate.
- V. Changes of relatively minor items not contemplated when the plans and specifications were prepared and the project was bid which are in the public interest and which do not exceed 10% of the contract price.

Under these guidelines the cumulative total of Change Orders, including any negotiations to bring the original contract price within the funds available, would become questionable if the total of such changes and negotiations exceed 10% of the original contract price. These guidelines are not intended to interfere with the Awarding Authority's good faith discretion to respond to specific situations in the public's best interest. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign the Change Order Justification prior to submission to the Division of Construction Management (DCM).

### **INSTRUCTIONS**

The CHANGE ORDER JUSTIFICATION is to be prepared by the design professional, who has evaluated the fairness and reasonableness of the proposed cost of the change(s) and recommends that the proposed Change Order be executed. The fully executed Form B-11: CHANGE ORDER JUSTIFICATION must accompany the proposed DCM Form C-12: Change Order. Instructions for completing the B-11 form are:

1. Insert the proposed Change Order Number, date of the Justification, and DCM (BC) Project Number in the spaces provided in the upper right-hand corner.
2. **Section (A):** Insert the complete name and address of the PROJECT, OWNER, CONTRACTOR, AND ARCHITECT/ENGINEER.
3. **Section (B):** Provide a complete description of the proposed changes in work, referring to and attaching revised specifications and/or drawings as appropriate. An attachment may be used if additional space is needed, but insert the proposed amount and time extension of the change(s) in the spaces provided. **Attached a copy of the contractor's detailed cost proposal.**
4. **Section (C):** Insert the Original Contract amount, the net increase or decrease of previous Change Orders, and the Current Contract amount (preceding the currently proposed Change Order).
5. **Section (D):** Explain why it is necessary, or in the public's interest, to make the proposed change(s) to the Work.
6. **Section (E):** Explain why award of the changed work to the existing contractor instead of awarding the work under the competitive bid process is justified.
7. **Section (F):** The design professional must state his evaluation of the reasonableness and fairness of the proposed costs based upon his review of the contractor's proposal.
8. **Section (G):** The design professional must recommend the Change Order to the Owner by signing the document; the Owner may require such recommendation from other individuals. The Owner must sign the document indicating that they believe change order action in lieu of the competitive bid process is justified for the proposed change(s). **Review of the matter and signing of the document by the Owner's legal counsel is highly recommended. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign the Change Order Justification prior to submission to DCM.**

**Alabama Department of Finance  
Real Property Management  
Division of Construction Management**

770 Washington Avenue, Suite 444  
Montgomery, Alabama 36104  
(334) 242-4082 (phone)

**CHANGE ORDER  
CHECKLIST**

*For use with DCM Form C-12 and DCM Form 9-J*

**WHICH FORM DO YOU USE?**

Use **DCM Form C-12** for contracts of state agencies and departments and State Department of Education (SDE) projects. Also use for ACCS projects with Notice-to-Proceeds issued prior to August 1, 2021. Use **DCM Form 9-J** for contracts of projects partially or fully Public School and College Authority (PSCA)-funded, except for ACCS projects with Notice-To-Proceeds issued after July 31, 2021. Include a completed **DCM Form B-11: Change Order Justification** with **each copy** of either DCM Forms C-12 or 9-J.

Verify that the following information is inserted in the spaces provided on the CONTRACT CHANGE ORDER form, or attached to the form where attachments are noted to be acceptable or obviously necessary. Do not staple forms; use clips.

<b>1.</b>	<b>CHANGE ORDER NUMBER:</b> Insert current change order number.
<b>2.</b>	<b>DATE:</b> Insert date.
<b>3.</b>	<b>DCM (BC) PROJECT NUMBER:</b> Insert DCM Project Number in the block provided at top of document.
<b>4.</b>	<b>CONTRACTOR</b> Insert name and address of the Contractor, exactly as they appear on the Construction Contract.
<b>5.</b>	<b>NAME OF PROJECT:</b> Under "Project", insert the complete name of the project as identified in the bid documents. If using DCM Form 9-J, insert the PSCA Project Number in the space provided.
<b>6.</b>	<b>CONTRACTOR'S PROPOSALS:</b> Under "TERMS", identify the change order proposals submitted by the contractor that are being addressed by the Contract Change Order. Identify these proposals by inserting their dates.
<b>7.</b>	<b>DESCRIPTION OF THE CHANGE(S) IN WORK:</b> Fully describe the change or changes to the original contract work for which the Construction Contract is being modified. This description should be written so that a reader of the document who is not directly involved in the project can understand what is being changed. If the space provided on the form is inadequate for such a description, use attachments and cite them.
<b>8.</b>	<b>CONTRACT AND CHANGE ORDER AMOUNTS:</b> Insert the applicable dollar amounts to record the original contract sum, change orders, and the currently revised contract sum.
<b>9.</b>	<b>EXTENSION OF TIME:</b> If the Contract Time is being extended by the Contract Change Order, insert appropriate number of <b>calendar days</b> in the space provided. If the Contract Time is not being extended, insert "NONE".
<b>10.</b>	<b>RESPONSIBILITY FOR CHANGE ORDER FUNDING - DCM Form 9-J ONLY:</b> The authority responsible for funding the change order is to be identified in the following sentence in the form,: "The amount of this Change Order will be the responsibility of _____." Insert whichever is appropriate: (1) "PSCA", (2) name of LEA, or (3) "PSCA" and name of LEA.
<b>11.</b>	<b>SIGNATURES:</b> The signature spaces for State Agency, PSCA and fully locally-funded Alabama Community College System projects are different from each other. Download the appropriate document per Owner/project type from <a href="http://www.dcm.alabama.gov/forms.aspx">www.dcm.alabama.gov/forms.aspx</a> . Before submitting a Contract Change Order to DCM, the document must be signed by the contractor, surety (for additive change orders only), design professional and owner (local owner or using agency). Signature by the surety is not necessary on deductive change orders or change orders involving only extensions of time. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign DCM Form B-11: Change Order Justification.
<b>12.</b>	<b>ATTACHMENTS:</b> To each <b>of the three (3) copies (with original signatures)</b> of the Contract Change Order form, attach with clips (do not staple): a. Contractor's change order proposals and/or invoices providing a detailed breakdown of change order costs. General Contractors (GC) must include subcontractors' (sub) quotes as backup. All GC and sub quotes must be broken down by labor (hours and rates), materials including quantities and unit prices (with receipts or quotes attached), equipment whether rented or owned (with receipts or quotes attached), and Overhead & Profit (OH&P). 1. Total OH&P can be a maximum of 25% divided between GC and subs; GC can have a maximum of 15% OH&P (in which case a sub could have up to 10% OH&P). See General Conditions- Article #19. 2. Sales tax cannot be included in change orders. 3. Deductive change orders also require backup including breakdown of labor and material, and must also deduct OH&P if included in original bid. Include specification section regarding allowances. b. <b>POWER OF ATTORNEY</b> for the individual signing the Contract Change Order for the surety. c. <b>DCM Form B-11, CHANGE ORDER JUSTIFICATION:</b> completed and signed by the design professional and owner.



# Alabama Department of Finance

## Real Property Management

### Division of Construction Management

P.O. Box 301150, Montgomery, AL 36130-1150  
770 Washington Ave, Ste 444, Montgomery, AL 36104  
(334) 242-4082 (phone)



## Change Order Guidance

See C-8: General Conditions of the Contract; Article 19: Changes in the Work, & Article 23: Delays at [https://dcm.alabama.gov/PDF/forms/C-8\\_Gen\\_Cond.pdf](https://dcm.alabama.gov/PDF/forms/C-8_Gen_Cond.pdf)

### Responses to Frequently Asked Questions

- There must be back-up for each item; each item must include a breakout of material and labor and its total.
- On the GC's Summary, each \$ amount for a subcontractor must have subcontractor's quote as backup.
- Subtotals on the General Contractor's (GC's) Summary must match subtotals on any subcontractors' paperwork.
- GC quotes and subquotes must be broken down by labor (hours and rates), materials including quantities and unit prices (with receipts or quotes attached), equipment whether rented or owned (with receipts or quotes attached), and Overhead & Profit (OH&P).
- GC's Summary and back-up invoices cannot include sales tax and cannot include charges for bonds.
- Total OH&P of each item can be maximum of 25% divided among GC & subcontractors. GC can have maximum of 15% OH&P. GC and subcontractors cannot include insurance in addition to OH&P.
  - Correct OH&P calculation example: 15% OH&P of a \$100.00 item is \$15.00, for a total of \$115.00.
  - False OH&P calculation example: For 15% OH&P, sometimes contractors will list 10% as OH of a \$100.00 item for an OH of \$10.00, add it to item for a subtotal of \$110.00, then calculate 5% Profit of \$110.00 subtotal as \$5.50 and add it all together for a total of \$115.50, but that is an incorrect calculation.
- Deductive change orders: Same backup as noted above is needed, including breakdown of material and labor, and must also deduct OH&P if included in original bid. Include specification section regarding allowances.

### Weather Delays

If additional days are requested due to weather, backup for such must be provided. Besides the following examples, alternate methods of calculation may be acceptable.

Example 1 - Provide a table displaying:

- a. Daily precipitation (in inches) at the site during the month associated with the report.
- b. The number of days in which the contractor **can anticipate precipitation** above 0.10 inches, for that particular calendar month, based on NOAA data from a location within the vicinity of the project (5-year average).
- c. The number of days in which the contractor **actually experienced precipitation** above 0.10 inches.
- d. Calculation:  $c - b =$  number of allowable weather delay days awarded to extend contract time.

Example 2 – Provide a summary and proof; summary can be written/typed on proof:

Summary:

- A. Number of lost days.
  - B. Total amount of actual rainfall for the lost days.
  - C. Average amount of rainfall of the past five years' pertinent month(s) for the matching month(s) of the lost days included in this change order.
  - D. Calculation:  $((B - C)/B) \times A =$  number of days requested to be added to the schedule via change order.
- Proof (website data, for example NOAA data, is acceptable proof):
- E. Proof of the lost days.
  - F. Proof of the average amount of rainfall of the past five years' pertinent month(s).

# FINAL PAYMENT CHECKLIST (FPC)

To be completed by the Architect/Engineer and submitted to DCM for review *via the correct DocuSign link from the Engage Portal*; applicable only to state agencies, partially or fully PSCA-funded and other bond-funded projects. The FPC shall include all attachments including the Contractor's Application for Final Payment. If all PSCA funds are expended prior to Final Payment, it is not a requirement to submit the Application & Certificate for Final Payment along with the supporting documentation to DCM.

(For further guidance refer to Article 34/Final Payment of DCM Form C-8: General Conditions of the Contract.)

<b>PROJECT:</b>		<b>DCM No.</b> _____ <b>PSCA No.</b> _____ <small>(If applicable)</small>
YES	N/A	Select "YES" or "N/A" as applicable.
<input type="checkbox"/>	<input type="checkbox"/>	Application and Certificate for Final Payment, DCM Form C-10: Attach one copy to FPC. The application must include original signatures of all parties and include all application attachments.
<input type="checkbox"/>		Certificate of Substantial Completion, DCM Form C-13: Attach one fully-executed copy to FPC.
<input type="checkbox"/>		<b>Affidavit of Advertisement for Completion:</b> Attach one copy of the affidavit of publication, including <b>the image of the advertisement which may be based on DCM Form C-14</b> , to the FPC. <b>An affidavit is a legal document issued by the publisher, which must be requested from the publisher.</b>
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's Affidavit of Payment of Debts & Claims, DCM Form C-18: Attach one copy to FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's Affidavit of Release of Liens, if required by Owner, DCM Form C-19: Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Consent of Surety to Final Payment, if any, To Contractor, DCM Form C-20: Consent is required for projects with P&P Bonds. Original has been delivered to Owner. Attach one copy to FPC.
<input type="checkbox"/>	<input type="checkbox"/>	General Contractor's Roofing Guarantee, DCM Form C-9, and Other Specified Roofing Guarantees, if any: Attached to Certificate of Substantial Completion.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's One-Year Warranty: Original has been delivered to the Owner. Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Other Warranties: All other specified original warranties has been delivered to the Owner. Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Record Documents: Specified "As-built" plans and specifications have been delivered to the Owner.
<input type="checkbox"/>		O & M Manuals: Specified instructions and O&M Manuals have been delivered to the Owner.
<input type="checkbox"/>	<input type="checkbox"/>	Time Extension: Over-run of Contract Time has been reconciled by: <input type="checkbox"/> Change Order <input type="checkbox"/> Liquidated Damages <input type="checkbox"/> Attached explanation
<input type="checkbox"/>	<input type="checkbox"/>	Additional Documents or Explanations which are attached:
<b>Submitted By:</b> _____ <div style="text-align: center; margin-left: 100px;">Architectural / Engineering Firm</div>		
_____	_____	_____
<small>Signature</small>	<small>Printed Name and Title</small>	<small>Date</small>

**Final Reconciliation of Fees:** Between the final change order execution and the year-end inspection, report the final project cost to **the Engage Portal at <https://engagealabama-rpm.facilityforce.cloud>** (back-up is not needed unless requested by DCM). DCM will then email a Final Reconciliation of Fees Statement to the Owner. If the Final Statement shows a net payment is owed to DCM, that amount must be paid prior to scheduling the year-end inspection. If the Final Statement shows a net refund is owed then a check will be mailed to the Owner.

DCM (BC) No. \_\_\_\_\_

# CERTIFICATION OF STRUCTURAL OBSERVATIONS

for

Project Name: \_\_\_\_\_

Owner Entity: \_\_\_\_\_

Contractor Company: \_\_\_\_\_

I \_\_\_\_\_, do hereby verify that I have personally conducted the visual  
Design Professional

observations of the construction of the structural system for conformance to the approved construction documents for the referenced project. The visual observations of the structural systems were personally conducted by me at all significant construction stages and at the completion of the construction of the structural system. To the best of my knowledge, all structural deficiencies have been resolved except as noted below:

Signed and sealed on this date, \_\_\_\_\_, 20 \_\_\_\_.

Design Professional's Seal:

\_\_\_\_\_  
Architectural / Engineering Firm

\_\_\_\_\_  
Signature of Architect or Structural Engineer of Record

\_\_\_\_\_  
Printed Name

- Specifications:** This form must be included in the project manual submitted to DCM for Final Plan Review for:
- All new public K-12 schools, awarded after July 1, 2010, with tornado storm shelters as required by Act 2010-746.
  - All public K-12 additions and renovations which are required to contain tornado storm shelters by the International Building Code, Section 423.
  - All private K-12 new schools, additions and renovations as required by the International Building Code, Section 423.
  - All new buildings containing classrooms or dorm rooms on the grounds of all public 2-year or 4-year institutions of higher education, statewide, awarded on or after August 1, 2012, as required by Act 2012-554. Exception: Alabama Community College System (ACCS) projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.

**Submittal of Form:** Provide a copy of the completed form to the DCM Inspector at Final Inspection. The original completed form, signed and sealed by the architect or structural engineer of record, must be included as an attachment to the Certificate of Substantial Completion submitted to DCM for:

- All new buildings constructed on the grounds of new public K-12 schools awarded after July 1, 2010.
- All new buildings containing classrooms or dorm rooms constructed on the grounds of public 2-year or 4-year institutions of higher education awarded on or after August 1, 2012. Exception: Alabama Community College System (ACCS) projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.



DCM No. \_\_\_\_\_

## OWNER'S STATEMENT OF RESPONSIBILITY FOR TORNADO STORM SHELTER (HURRICANE SHELTER WHERE APPLICABLE)

Project Name: \_\_\_\_\_

Owner Entity: \_\_\_\_\_

Architectural/Engineering Firm: \_\_\_\_\_

Contractor Company: \_\_\_\_\_

I \_\_\_\_\_, acknowledge that I am responsible as the Owner, to the  
Owner

Alabama Department of Finance - Division of Construction Management, the State Department of Education, or the State Fire Marshal, as applicable. I certify that control shall be exercised to maintain compliance with the requirements of ICC 500. The procedures for exercising post occupancy control shall be as listed below:

- The provision of a written statement outlining shelter preparedness, normal and emergency operation, and maintenance, prior to the issuance of a certificate of occupancy
- The provision of a written plan to be followed by the owner or the owner's authorized agent for annual evaluation of the storm shelter envelope to assess the integrity of the walls and roof systems.
- The provision of a written plan to be followed by the owner or the owner's authorized agent for annual evaluation of the storm shelter envelope to assess the integrity of the openings impact-protective systems to assure that doors, windows, or other protective devices are in compliance with the respective manufacturer's operational and maintenance requirements.

Note the following:

- Storm shelters shall be maintained in an operable condition at all times, all structural, protective, and environmental systems shall be repaired or replaced when found to be damaged or inoperable.
- Should it become necessary to replace certified or listed impact-resistant systems, replacements shall comply with the listed ICC 500 requirements, and shall have been tested and shall be installed as is required for new construction.

Record Keeping:

A complete dated record of the storm shelter evaluations, changes, or replacements shall be maintained by the owner or the owner's authorized agent. Signed records of evaluations, tests, repairs, replacements or other operations and maintenance shall be kept on the premises or other approved location.

Signed on this date, \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
Owner Entity Name

By \_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name and Title

**Specifications:** This form must be included in the project manual submitted to DCM for Final Plan Review for:

- All new **public K-12 (including Charter)** schools, awarded after July 1, 2010, with tornado storm shelters as required by Act 2010-746.
- All **public K-12 (including Charter)** additions and renovations which are required to contain tornado storm shelters by the International Building Code, Section 423.
- All **private K-12** new schools, additions and renovations as required by the International Building Code, Section 423.
- All new buildings containing classrooms or dorm rooms on the grounds of all **public 2-year or 4-year institutions of higher education**, statewide, awarded on or after August 1, 2012, as required by Act 2012-554.
- State Agency/Authority projects when assigned to DCM.**

**Submittal of Executed Form:** Completed and signed form must be submitted to DCM Inspector at pre-construction conference for:

- All new buildings to be constructed on the grounds of new **public K-12 (including Charter)** schools awarded after July 1, 2010.
- All new buildings containing classrooms or dorm rooms to be constructed on the grounds of all **public 2-year or 4-year institutions of higher education** awarded on or after August 1, 2012.
- State Agency/Authority projects when assigned to DCM.**

**Records:** The completed and signed form must be kept with the Owner's storm shelter records.



# ALABAMA Department of Revenue

ST: EXC-01  
6/21

Sales and Use Tax Division  
p.o. box 327710 • montgomery, Al 36132-7710

## Application for Sales and use tax Certificate of exemption

### FOR GOVERNMENT ENTITY PROJECT

This Certificate of Exemption will be limited to purchases which qualify for an exemption of sales and use taxes pursuant to Rule No. 810-6-3-.77

#### PROJECT INFORMATION:

PROJECT NAME			PROJECT OWNER'S FEIN (EXEMPT ENTITY)		
STREET ADDRESS OF PROJECT (CITY AND COUNTY INCLUDED)		CITY	ZIP	COUNTY	

#### APPLICANT'S INFORMATION:

RELATION: (CHOOSE ONE)  
 Government Entity     General Contractor     Subcontractor

APPLICANT'S LEGAL NAME			FEIN		
DBA			CONSUMER'S USE TAX ACCOUNT NUMBER		
MAILING ADDRESS: STREET		CITY	STATE	ZIP	COUNTY
CONTACT PERSON				BUSINESS TELEPHONE NUMBER (    )	
EMAIL ADDRESS					

CONTRACT SIGN DATE (PROVIDED BY GENERAL CONTRACTOR)		CONTRACT COMPLETION DATE (PROVIDED BY GENERAL CONTRACTOR)	
ESTIMATED START DATE (FOR APPLICANT)		ESTIMATED COMPLETION DATE (FOR APPLICANT)	
WILL THE APPLICANT HAVE ANY SUBCONTRACTORS ON THIS JOB? <input type="checkbox"/> Yes <input type="checkbox"/> No    If yes, please attach list.		NAME OF PARTY TO THE CONTRACT	

JOB DESCRIPTION

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE? <input type="checkbox"/> Yes <input type="checkbox"/> No		ESTIMATED POLLUTION CONTROL COST \$	
TOTAL PROJECT BID AMOUNT (APPLICANT'S PORTION OF PROJECT) \$	LABOR COST (APPLICANT'S PORTION OF PROJECT) \$	MATERIAL COST (APPLICANT'S PORTION OF PROJECT) \$	

#### REVENUE DEPARTMENT USE ONLY

PENDING DOCUMENTATION / INFORMATION:  
 GCL     SBL     Contract / NTP / LOI     LOS     Contract Dates / Breakdown of Costs

Contact Dates: \_\_\_\_\_ Received Date: \_\_\_\_\_

Forwarded for Denial: \_\_\_\_\_

PROJECT NAME

PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

# Individual # Partnership # Corporation # Multi member LLC # Single member LLC # Government Entity

If applicant is a corporation, a copy of the certified certificate of incorporation, amended certificate of incorporation, certificate of authority, or articles of incorporation should be attached. If the applicant is a limited liability company or a limited liability partnership, a copy of the certified articles of organization should be attached.

OWNERSHIP INFORMATION:

Corporations – give name, title, home address, and Social Security Number of each officer.

Partnerships – give name, home address, Social Security Number or FEIN of each partner.

Sole Proprietorships – give name, home address, Social Security Number of owner.

LLC – give name, home address, and Social Security Number or FEIN of each member.

LLP – give name, home address, and Social Security Number or FEIN of each partner.

NAME (PLEASE PRINT)

SIGNATURE

TITLE

DATE

REVENUE DEPARTMENT USE ONLY

PENDING OTHER:

# Government Entity # General Contractor # Not on LOS

Contact Dates: \_\_\_\_\_ Received Date: \_\_\_\_\_

Forwarded for Denial: \_\_\_\_\_

Examiner's Remarks \_\_\_\_\_

Examiner \_\_\_\_\_ Date \_\_\_\_\_



# instructions for preparation of form St: exC-01

## Sales and use tax Certificate of exemption for Government entity project

note: exemption Certificates will be issued as of the contract sign date or the received date of the application. If, upon receipt of the application, the project has already commenced, the certificate will be issued as of the received date of the application. Any purchases made prior to the issuance of a certificate will not be exempt.

**\*\*\* Please allow 10 to 14 business days for your application to be processed. \*\*\***

In order to expedite the processing of your application, please include the following documentation when submitting your application:

### **Exempt Entity:**

1. Signed Application
2. Copy of executed/Signed Contract, Letter of intent, notice of Award, and/or notice to proceed

### **General Contractor:**

1. Signed Application
2. Copy of executed/Signed Contract, Letter of intent, notice of Award, and/or notice to proceed
3. List of Subcontractors
4. Alabama board of General Contractor's License
5. State/County business License (usually obtained through county probate office)
6. Any other municipal business licenses associated with the project

### **Subcontractor:**

1. Signed Application
2. Alabama board of General Contractor's License
3. State/County business License (usually obtained through county probate office)
4. Any other municipal business licenses associated with the project
5. List of Subcontractors (if any)

### **General contractors and subcontractors:**

- Any additions and/or deletions to the list of subcontractors working on a project must be submitted to the Department within 30 days of occurrence.
- If an extension is needed for a project, please contact the Department of revenue at the address, number, or email listed below. Extension requests should be submitted no more than 30 days after expiration date.
- Subcontractor's estimated Start Date should be the date they will begin working on the project and ordering materials instead of the General Contractor's estimated Start Date for the project.

There is a filing requirement if Your Application is Approved. The return will be filed through the Consumer's use tax account. Please see the following page for detailed instructions and general information regarding the reporting requirements.

the application and required documentation may be mailed, faxed, or emailed to the following:

fax: (334) 353-7867

email: St exemptionunit@revenue.alabama.gov

mailing Address: Attn: Contractor's exemption  
Alabama Department of revenue  
Sales & use tax Division  
room 4303  
po box 327710  
montgomery, AL 36132-7710

## *General Information and Instructions Regarding the Reporting Requirements for Contractors Awarded an Exemption Certificate*

A contractor's exemption certificate for a Government entity project is needed in order to purchase materials tax exempt for the qualified project. Once the exemption certificate has been applied for and awarded, there is a monthly filing requirement to report the purchases that have been made for each exempt project. The Consumer's Use (Cnu) tax account is used to report the tax-exempt purchases made with each certificate for each exempt project for each month.

The consumer's use tax return must be filed for each of the months covered by the exemption certificate. (For example, if the certificate's effective date is June 29, 2014 and the expected completion date is October 1, 2014, a consumer's use tax return must be filed for each of the following months: June, July, August, September, and October.) A return must be filed each month to report the monthly purchases. Therefore, all active exemption certificates must be included on the monthly report even if the monthly purchases for a specific project was \$0.

If a Cnu tax account is not already open under the taxpayer/business name, one will automatically be assigned at the time the exemption certificate is generated. Electronic filing is required through the Department's online filing system, my Alabama taxes (mAt). A letter containing the online filing information will be mailed to the address on file within a few days after the new Cnu tax account has been assigned. This letter will contain all the information needed to create your online filing account in mAt. For questions relating to setting up the account on [www.myalabamataxes.alabama.gov](http://www.myalabamataxes.alabama.gov), please contact business registration at 334-242-1584 or the Sales Tax Division at 1-866-576-6531.

Once the mAt account is set up, please log in and file the monthly Cnu tax return. There is a table located at the bottom left hand corner labeled "Contractor's exemption for Government Construction projects." All three fields in the table are required to be completed: exemption number, project number, and total amount of purchases for that specific project for the month. Additional projects may be added on the additional rows that appear as data is added; the table will allow the addition of more projects.

\*\*\*Please do not use lines 1 through 9 of the return for reporting exempt project information. Leave these lines blank unless taxable purchases were made outside of the state of Alabama that need to be reported and tax remitted. (Lines 1 through 9 do not have anything to do with the exemption reporting requirements).

When the certificate expires (upon the project's completion) and the Cnu tax account is no longer needed, please contact the business registration unit at 334-242-1584 and close the Cnu tax account. Please be advised that if there are multiple government entity projects open, the consumer's use tax account should remain open until the last project completion date. For example, if project exC00AbCD ends in June of 2014 but project exC00efGH ends January of 2015, the Cnu tax account must remain open until the end of January 2015. A return for project exC00efGH must be filed all the way through January 2015.

If the applicant already has a Cnu tax account and it is currently set up online, please use this account to report exempt project purchases through [www.myalabamataxes.alabama.gov](http://www.myalabamataxes.alabama.gov) using the instructions provided above. The return may then be filed as usual.

\*\*\*All Consumer's use tax returns are due on the 20th of the month following the month in which purchases were made (i.e., the return for the month of June is due July 20th, etc. There are 20 days to file the return before it is deemed late.)

\*\*\*Any penalty waiver requests may be directed to the Sales and Use Tax Division at 1-866-576-6531. Only one waiver per 18 month period is allowed.

# INSTRUCTIONS TO BIDDERS

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### 9. 1. **BID DOCUMENTS:**

The Bid Documents consist of the Advertisement for Bids, these Instructions to Bidders, any supplements to these Instructions to Bidders, the Proposal Form and the Accounting of Sales Tax, and the proposed Contract Documents. The proposed Contract Documents consist of the Construction Contract, the Performance Bond and Payment Bond, the Conditions of the Contract (General, Supplemental, and other Conditions), Drawings, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

### 2. **GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:**

When the amount bid for a contract is **\$100,000 or more**, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. In case of a joint venture of two or more contractors, the amount of the bid shall be within the maximum bid limitation as set by the State Licensing Board for General Contractors of the combined limitations of the partners to the joint venture.

### 3. **QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:**

**a.** Any special qualifications required of general contractors, subcontractors, material suppliers, or fabricators are set forth in the Bid Documents.

**b.** The Awarding Authority may have elected to prequalify bidders. Parties interested in bidding for this contract are directed to the Advertisement for Bids and Supplemental Instructions to Bidders to determine whether bidders must be prequalified and how they may obtain copies of the Awarding Authority's published prequalification procedures and criteria.

c. Release of Bid Documents by the Architect to a prospective bidder will not constitute any determination by the Awarding Authority or Architect that the bidder has been found to be qualified, prequalified, or responsible.

**4. PREFERENCE to RESIDENT CONTRACTORS:**

(If this project is federally funded in whole or in part, this Article shall not apply.)

a. In awarding the Contract, preference will be given to Alabama resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded the Contract only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances.

b. A nonresident bidder is a contractor which is neither organized and existing under the laws of the State of Alabama, nor maintains its principal place of business in the State of Alabama. A nonresident contractor which has maintained a permanent office within the State of Alabama for at least five continuous years shall not thereafter be deemed to be a non-resident contractor so long as the contractor continues to maintain a branch office within Alabama.

**5. EXAMINATION of BID DOCUMENTS and the SITE of the WORK:**

Before submitting a bid for the Work, the bidders shall carefully examine the Bid Documents, visit the site, and satisfy themselves as to the nature and location of the Work, and the general and local conditions, including weather, the general character of the site or building, the character and extent of existing work within or adjacent to the site and any other work being performed thereon at the time of submission of their bids. They shall obtain full knowledge as to transportation, disposal, handling, and storage of materials, availability of water, electric power, and all other facilities in the area which will have a bearing on the performance of the Work for which they submit their bids. The submission of a bid shall constitute a representation by the bidder that the bidder has made such examination and visit and has judged for and satisfied himself or herself as to conditions to be encountered regarding the character, difficulties, quality, and quantities of work to be performed and the material and equipment to be furnished, and as to the contract requirements involved.

**6. EXPLANATIONS and INTERPRETATIONS:**

a. Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.

b. Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.

c. In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

## 7. SUBSTITUTIONS:

**a.** The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer's name, model number, etc. (hereinafter referred to as "source"), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph "d" below apply.

**b.** When the Bid Documents identify only one or two sources, or three or more sources followed by "or approved equal" or similar wording, the bidder's proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without "Pre-bid Approval" as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.

**c.** When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not identified in the Bid Documents or granted "Pre-Bid Approval" will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.

**d.** If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder's proposal must be based upon the identified sole source.

**e. Procedures for "Pre-bid Approval".** If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect's discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

## 8. PREPARATION and DELIVERY of BIDS:

### a. DCM Form C-3: Proposal Form:

- (1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted. A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with the Proposal Form.
- (2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.
- (3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:
  - (a) the legal name of the bidder,
  - (b) the state under which laws the bidder's business is organized and existing,
  - (c) the city (and state) in which the bidder has its principal offices,
  - (d) the bidder's business organization, i.e., corporation, partnership, or individual (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and
  - (e) the partners or officers of the bidder's organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert "See Attachment" in this space and provide the listing on an attachment to the Proposal Form.
- (4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.
- (5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.
- (6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.
- (7) The Proposal Form shall be properly signed by the bidder. If the bidder is:
  - (a) **an individual**, that individual or his or her "authorized representative" must sign the Proposal Form;
  - (b) **a partnership**, the Proposal Form must be signed by one of the partners or an "authorized representative" of the Partnership;
  - (c) **a corporation**, the president, vice-president, secretary, or "authorized representative" of the corporation shall sign and affix the corporate seal to the Proposal Form.

As used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying the bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation) and shall be attached to the Proposal Form.

(8) Interlineation, alterations or erasures on the Proposal Form must be initialed by the bidder or its “authorized representative”.

**b. DCM Form C-3A: Accounting of Sales Tax**

A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

**c. Bid Guaranty**

(1) The Proposal Form must be accompanied by a cashier’s check, drawn on an Alabama bank, or a Bid Bond, executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority.

(2) If a Bid Bond is provided in lieu of a cashier’s check, the bond shall be on the Bid Bond form as stipulated in the Bid Documents.

(3) The amount of the cashier’s check or Bid Bond should not be less than five percent of the contractor’s bid, but is not required to be in an amount more than ten thousand dollars.

**d. Delivery of Bids:**

(1) Bids will be received until the time set, and at the location designated, in the Advertisement for Bids unless notice is given of postponement. Any bid not received prior to the time set for opening bids will be rejected absent extenuating circumstances and such bids shall be rejected in all cases where received after other bids are opened.

(2) Each bid shall be placed, together with the bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters “Proposal”, below which the bidder shall identify the Project and the Work bid on, the name of the bidder, and the bidder’s current general contractor’s state license number.

(3) Bids may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, the sealed envelope containing the bid, marked as indicated above, shall be enclosed in another envelope for mailing.

**9. WITHDRAWAL or REVISION of BIDS:**

**a.** A bid may be withdrawn prior to the time set for opening of bids, provided a written request, executed by the bidder or the bidder’s “authorized representative”, is filed with the Architect prior to that time. The bid will then be returned to the bidder unopened.

**b.** A bid which has been sealed in its delivery envelope may be revised by writing the change in price and date on the outside of the delivery envelope over the signature of the bidder or the bidder’s “authorized representative”. In revising the bid in this manner, the bidder must only write the amount of the change in price on the envelope **and must not reveal the bid price.**

c. Written communications, signed by the bidder or its “authorized representative”, to revise bids will be accepted if received by the Architect prior to the time set for opening bids. The Architect will record the instructed revision upon opening the bid. Such written communication may be by facsimile if so stipulated in Supplemental Instructions to Bidders. In revising the bid in this manner, the bidder must only write the amount of the change in price **and must not reveal the bid price.**

d. Except as provided in Article 12 of these Instructions to Bidders, no bid shall be withdrawn, modified, or corrected after the time set for opening bids.

## 10. OPENING of BIDS:

a. Bids will be opened and read publicly at the time and place indicated in the Advertisement for Bids. Bidders or their authorized representatives are invited to be present.

b. A list of all proposed major subcontractors and suppliers will be submitted by Bidders to the Architect at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. If the list includes a fire alarm contractor and/or fire sprinkler contractor, Bidders will also submit a copy of the fire alarm contractor’s and/or fire sprinkler contractor’s permits from the State of Alabama Fire Marshal’s Office.

## 11. INCOMPLETE and IRREGULAR BIDS:

A bid that is not accompanied by data required by the Bid Documents, or a bid which is in any way incomplete, may be rejected. Any bid which contains any uninitialed alterations or erasures, or any bid which contains any additions, alternate bids, or conditions not called for, or any other irregularities of any kind, will be subject to rejection.

## 12. BID ERRORS:

a. **Errors and Discrepancies in the Proposal Form.** In case of error in the extension of prices in bids, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

b. **Mistakes within the Bid.** If the low bidder discovers a mistake in its bid, the low bidder may seek withdrawal of its bid without forfeiture of its bid guaranty under the following conditions:

(1) **Timely Notice:** The low bidder must notify the Awarding Authority and Architect in writing, within three working days after the opening of bids, that a mistake was made. This notice must be given within this time frame whether or not award has been made.

(2) **Substantial Mistake:** The mistake must be of such significance as to render the bid price substantially out of proportion to the other bid prices.

(3) **Type of Mistake:** The mistake must be due to calculation or clerical error, an inadvertent omission, or a typographical error which results in an erroneous sum. A mistake of law, judgment, or opinion shall not constitute a valid ground for withdrawal without forfeiture.



**(4) Documentary Evidence:** Clear and convincing documentary evidence of the mistake must be presented to the Awarding Authority and the Architect as soon as possible, but no later than three working days after the opening of bids.

The Awarding Authority's decision regarding a low bidder's request to withdraw its bid without penalty shall be made within 10 days after receipt of the bidder's evidence or by the next regular meeting of the Awarding Authority. Upon withdrawal of bid without penalty, the low bidder shall be prohibited from (1) doing work on the project as a subcontractor or in any other capacity and (2) bidding on the same project if it is re-bid.

### **13. DISQUALIFICATION of BIDDERS:**

Any bidder(s) may be disqualified from consideration for contract award for the following reasons:

**a. Collusion.** Any agreement or collusion among bidders or prospective bidders in restraint of freedom of competition to bid at a fixed price or to refrain from bidding or otherwise shall render the bids void and shall cause the bidders or prospective bidders participating in such agreement or collusion to be disqualified from submitting further bids to the Awarding Authority on future lettings. (See § 39-2-6, Code of Alabama 1975, for possible criminal sanctions.)

**b. Advance Disclosure.** Any disclosure in advance of the terms of a bid submitted in response to an Advertisement for Bids shall render the proceedings void and require re-advertisement and rebid.

**c. Failure to Settle Other Contracts.** The Awarding Authority may reject a bid from a bidder who has not paid, or satisfactorily settled, all bills due for labor and material on other contracts in force at the time of letting.

### **14. CONSIDERATION of BIDS:**

**a.** After the bids are opened and read publicly, the bid prices will be compared and the results of this comparison will be available to the public. Until the final award of the contract, however, the Awarding Authority shall have the right to reject any or all bids, and it shall have the right to waive technical errors and irregularities if, in its judgment, the bidder will not have obtained a competitive advantage and the best interests of the Awarding Authority will be promoted.

**b.** If the Bid Documents request bids for projects or parts of projects in combination or separately, the Bid Documents must include supplements to, these Instructions to Bidders setting forth applicable bid procedures. Award or awards will be made to the lowest responsible and responsive bidder or bidders in accordance with such bid procedures.

### **15. DETERMINATION of LOW BIDDER by USE of ALTERNATES:**

**a.** The Awarding Authority may request alternate bid prices (alternates) to facilitate either reducing the base bid to an amount within the funds available for the project or adding items to the base bid within the funds available for the project. Alternates, if any, are listed in the

Proposal Form in the order in which they shall cumulatively deduct from or add to the base bid for determining the lowest bidder.

**b.** If alternates are included in the Proposal Form, the Awarding Authority shall determine the dollar amount of funds available and immediately prior to the opening of bids shall announce publicly the funds available for the project. The dollar amount of such funds shall be used to determine the lowest bidder as provided herein below, notwithstanding that the actual funds available for the project may subsequently be determined to be more or less than the expected funds available as determined immediately prior to the time of the opening of bids.

**c.** If the base bid of the lowest bidder exceeds the funds available and alternate bid prices will reduce the base bids to an amount that is within the funds available, the lowest bidder will be determined by considering, in order, the fewest number of the alternates that produces a price within the funds available. If the base bid of the lowest bidder is within the funds available and alternate bid prices will permit adding items to the base bid, the lowest bidder will be determined by considering, in order, the greatest number of the alternates that produces a price within the funds available.

**d.** After the lowest bidder has been determined as set forth above, the Awarding Authority may award that bidder any combination of alternates, provided said bidder is also the low bidder when only the Base Bid and such combination of alternates are considered.

## **16. UNIT PRICES:**

**a. Work Bid on a Unit Price Basis.** Where all, or part(s), of the planned Work is bid on a unit price basis, both the unit prices and the extensions of the unit prices constitute a basis of determining the lowest responsible and responsive bidder. In cases of error in the extension of prices of bids, the unit price will govern. A bid may be rejected if any of the unit prices are obviously unbalanced or non-competitive.

**b. Unit Prices for Application to Change Orders.** As a means of predetermining unit costs for changes in certain elements of the Work, the Bid Documents may require that the bidders furnish unit prices for those items in the Proposal Form. Unit prices for application to changes in the work are not a basis for determining the lowest bidder. Non-competitive unit prices proposed by the successful bidder may be rejected and competitive prices negotiated by the Awarding Authority prior to contract award. Unit prices for application to changes in the work are not effective unless specifically included and agreed upon in the Construction Contract.

## **17. AWARD of CONTRACT:**

**a.** The contract shall be awarded to the lowest responsible and responsive bidder unless the Awarding Authority finds that all the bids are unreasonable or that it is not in the best interest of the Awarding Authority to accept any of the bids. A responsible bidder is one who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the contract. A responsive bidder is one who submits a bid that complies with the terms and conditions of the Advertisement for Bids and the Bid Documents. Minor irregularities in the bid shall not defeat responsiveness.

**b.** A bidder to whom award is made will be notified by telegram, confirmed facsimile, or letter to the address shown on the Proposal Form at the earliest possible date. Unless other

time frames are stipulated in Supplemental Instructions to Bidders, the maximum time frames allowed for each step of the process between the opening of bids and the issuance of an order to proceed with the work shall be as follows:

<b>(1)</b> Award of contract by Awarding Authority	30 calendar days after the opening of bids
<b>(2)</b> Contractor’s return of the fully executed contract, with bonds and evidence of insurance, to the Awarding Authority	15 calendar days after the contract has been presented to the contractor for signature (from the Lead Design Professional)
<b>(3)</b> Awarding Authority’s approval of the contractor’s bonds and evidence of insurance and completion of contract execution	20 calendar days after the contractor presents complete and acceptable documents to the Architect
<b>(4)</b> Notice To Proceed issued to the contractor along with distribution of the fully executed construction contract to all parties.	15 calendar days after final execution of contract by the Awarding Authority, by various State Agencies if required and by the Governor if his or her signature on the contract is required by law

The time frames stated above, or as otherwise specified in the Bid Documents, may be extended by written agreement between the parties. Failure by the Awarding Authority to comply with the time frames stated above or stipulated in Supplemental Instructions to Bidders, or agreed extensions thereof, shall be just cause for the withdrawal of the contractor’s bid and contract without forfeiture of bid security.

**c.** Should the successful bidder or bidders to whom the contract is awarded fail to execute the Construction Contract and furnish acceptable Performance and Payment Bonds and satisfactory evidence of insurance within the specified period, the Awarding Authority shall retain from the bid guaranty, if it is a cashier’s check, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded and the amount of the bid of the next lowest responsible and responsive bidder, but not more than \$10,000. If no other bids are received, the full amount of the bid guaranty shall be so retained or recovered as liquidated damages for such default. Any sums so retained or recovered shall be the property of the Awarding Authority.

**d.** All bid guaranties, except those of the three lowest bona fide bidders, will be returned immediately after bids have been checked, tabulated, and the relation of the bids established. The bid guaranties of the three lowest bidders will be returned as soon as the contract bonds and the contract of the successful bidder have been properly executed and approved. When the award is deferred for a period of time longer than 15 days after the opening of the bids, all bid guaranties, except those of the potentially successful bidders, shall be returned. If no award is made within the specified period, as it may by agreement be extended, all bids will be rejected, and all guaranties returned. If any potentially successful bidder agrees in writing to a stipulated extension in time for consideration of its bid and its bid was guaranteed with a cashier’s check, the Awarding Authority may permit the potentially successful bidder to substitute a satisfactory bid bond for the cashier’s check.

# PROPOSAL FORM

To: \_\_\_\_\_ Date: \_\_\_\_\_  
(Awarding Authority)

In compliance with the Advertisement for Bids and subject to all the conditions thereof, the undersigned

\_\_\_\_\_  
(Legal Name of Bidder)

hereby proposes to furnish all labor and materials and perform all work required for the construction of  
**WORK** \_\_\_\_\_

in accordance with Drawings and Specifications, dated \_\_\_\_\_, prepared by  
\_\_\_\_\_, Architect/Engineer.

The Bidder, which is organized and existing under the laws of the State of \_\_\_\_\_,  
having its principal offices in the City of \_\_\_\_\_,  
is:  a Corporation  a Partnership  an Individual  (other) \_\_\_\_\_.

**LISTING OF PARTNERS OR OFFICERS:** If Bidder is a Partnership, list all partners and their  
addresses; if Bidder is a Corporation, list the names, titles, and business addresses of its officers:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**BIDDER'S REPRESENTATION:** The Bidder declares that it has examined the site of the Work,  
having become fully informed regarding all pertinent conditions, and that it has examined the Drawings  
and Specifications (including all Addenda received) for the Work and the other Bid and Contract  
Documents relative thereto, and that it has satisfied itself relative to the Work to be performed.

**ADDENDA:** The Bidder acknowledges receipt of Addenda Nos. \_\_\_\_\_ through \_\_\_\_\_ inclusively.

**BASE BID:** For construction complete as shown and specified, the sum of \_\_\_\_\_  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

**ALTERNATES:** If alternates as set forth in the Bid Documents are accepted, the following adjustments  
are to be made to the Base Bid:

- For Alternate No. 1 ( ..... )  (add)  (deduct) \$ \_\_\_\_\_  
(Insert key word for Alternate)
- For Alternate No. 2 ( ..... )  (add)  (deduct) \$ \_\_\_\_\_
- For Alternate No. 3 ( ..... )  (add)  (deduct) \$ \_\_\_\_\_
- For Alternate No. 4 ( ..... )  (add)  (deduct) \$ \_\_\_\_\_
- For Alternate No. 5 ( ..... )  (add)  (deduct) \$ \_\_\_\_\_
- For Alternate No. 6 ( ..... )  (add)  (deduct) \$ \_\_\_\_\_

**UNIT PRICES** - (Attach to this Proposal Form the unit prices, if any, on a separate sheet.)

**BID SECURITY:** The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within fifteen calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within 30 calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply.

Attached hereto is a: *(Mark the appropriate box and provide the applicable information.)*

- Bid Bond, executed by \_\_\_\_\_ as Surety,  
 a cashier's check on the \_\_\_\_\_ Bank of \_\_\_\_\_,  
for the sum of \_\_\_\_\_  
Dollars (\$ \_\_\_\_\_) made payable to the Awarding Authority.

**BIDDER'S ALABAMA LICENSE:**

State License for General Contracting: \_\_\_\_\_  
License Number Bid Limit Type(s) of Work

**CERTIFICATIONS:** The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids.

**Legal Name of Bidder** \_\_\_\_\_

Mailing Address \_\_\_\_\_

\* **By (Legal Signature)** \_\_\_\_\_

\* Name & Title (print) \_\_\_\_\_ (Seal)

Telephone Number \_\_\_\_\_

Email Address \_\_\_\_\_

\* If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.

Note: A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

# ACCOUNTING OF SALES TAX

## Attachment to DCM Form C-3: Proposal Form

To: \_\_\_\_\_ Date: \_\_\_\_\_  
(Awarding Authority)

NAME OF PROJECT \_\_\_\_\_

### SALES TAX ACCOUNTING

Pursuant to Act 2013-205, Section 1(g) the Contractor accounts for the sales tax NOT included in the bid proposal form as follows:

#### ESTIMATED SALES TAX AMOUNT

BASE BID: \$ \_\_\_\_\_

Alternate No. 1 (.....)  (add)  (deduct) \$ \_\_\_\_\_  
(Insert key word for Alternate)

Alternate No. 2 (.....)  (add)  (deduct) \$ \_\_\_\_\_

Alternate No. 3 (.....)  (add)  (deduct) \$ \_\_\_\_\_

Alternate No. 4 (.....)  (add)  (deduct) \$ \_\_\_\_\_

Alternate No. 5 (.....)  (add)  (deduct) \$ \_\_\_\_\_

Alternate No. 6 (.....)  (add)  (deduct) \$ \_\_\_\_\_

**Failure to provide an accounting of sales tax shall render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.**

Legal Name of Bidder \_\_\_\_\_

Mailing Address \_\_\_\_\_

\*By (Legal Signature) \_\_\_\_\_

\*Name (type or print) \_\_\_\_\_ (Seal)

\*Title \_\_\_\_\_

Telephone Number \_\_\_ Email Address \_\_\_\_\_

Note: A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A with DCM Form C-3 is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

# BID BOND

The **PRINCIPAL** (*Bidder's company name and address*)

Name:  
Address:

The **SURETY** (*Company name and primary place of business*)

Name:  
Address:

The **OWNER** (*Entity name and address*)

Name:  
Address:

The **PROJECT** for which the Principal's Bid is submitted: (*Project name as it appears in the Bid Documents*)

**KNOW ALL MEN BY THESE PRESENTS**, that we, the undersigned Principal and Surety, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the **PENAL SUM of five percent (5%) of the amount of the Principal's bid, but in no event more than Ten-thousand Dollars (\$10,000.00).**

**THE CONDITION OF THIS OBLIGATION** is that the Principal has submitted to the Owner the attached bid, which is incorporated herein by reference, for the Project identified above.

**NOW, THEREFORE**, if, within the terms of the Bid Documents, the Owner accepts the Principal's bid and the Principal thereafter either:

- (a) executes and delivers a Construction Contract with the required Performance and Payment Bonds (each in the form contained in the Bid Documents and properly completed in accordance with the bid) and delivers evidence of insurance as prescribed in the Bid Documents, or
  - (b) fails to execute and deliver such Construction Contract with such Bonds and evidence of insurance, but pays the Owner the difference, not to exceed the Penal Sum of this Bond, between the amount of the Principal's Bid and the larger amount for which the Owner may award a Construction Contract for the same Work to another bidder,
- then**, this obligation shall be null and void, otherwise it shall remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligation of the Surety under this Bond shall not in any manner be impaired or affected by any extension of the time within which the Owner may accept the Principal's bid, and the Surety does hereby waive notice of any such extension.

**SIGNED AND SEALED** this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

ATTEST:

\_\_\_\_\_

**PRINCIPAL:**

\_\_\_\_\_  
By \_\_\_\_\_

\_\_\_\_\_  
Name and Title

**SURETY:**

ATTEST:

\_\_\_\_\_

\_\_\_\_\_  
By \_\_\_\_\_

\_\_\_\_\_  
Name and Title

*This form is provided solely for the purpose of inclusion in the project manual. A Construction Contract for fully locally-funded K-12 projects must be initiated via the appropriate DocuSign link from DCM's Engage Portal at <https://engagealabama-rpm.facilityforce.cloud> by the Lead Design Professional Firm.*

**DCM (BC) Project No.**

Numbers in margin correspond to "Checklist", DCM Form B-

## CONSTRUCTION CONTRACT

- (1) This Construction Contract is entered into this \_\_\_\_\_ day of \_\_\_\_\_ in the year of \_\_\_\_\_
- (2) between the **OWNER**,  
Entity Name:  
Address:  
Email & Phone #:
- (3) and the **CONTRACTOR**,  
Company Name:  
Address:  
Email & Phone #:
- (4) for the **WORK** of the Project, identified as:
- (5) The **CONTRACT DOCUMENTS** are dated \_\_\_\_\_ and have been amended by  
(6) **ADDENDA**
- (7) The **ARCHITECT** is  
Firm Name:  
Address:  
Email & Phone #:
- (8) The **CONTRACT SUM** is \_\_\_\_\_ Dollars (\$) \_\_\_\_\_ ) and is the sum of the Contractor's Base Bid for the Work and the following  
(9) **BID ALTERNATE PRICES:**
- (10) The **CONTRACT TIME** is \_\_\_\_\_ ( \_\_\_\_\_ ) calendar days.
- THE OWNER AND THE CONTRACTOR AGREE AS FOLLOWS:** The Contract Documents, as defined in the General Conditions of the Contract (DCM Form C-8), are incorporated herein by reference. The Contractor shall perform the Work in accordance with the Contract Documents. The Owner will pay and the Contractor will accept as full compensation for such performance of the Work, the Contract Sum subject to additions and deductions (including liquidated damages) as provided in the Contract Documents. The Work shall commence on a date to be specified in a Notice to Proceed issued by the Owner (or by the Lead Design Professional on the Owner's behalf), and shall then be substantially completed within the Contract Time.
- (11) **LIQUIDATED DAMAGES** for which the Contractor and its Surety (if any) shall be liable and may be required to pay the Owner in accordance with the Contract Documents shall be equal to six percent interest per annum on the total Contract Sum unless a dollar amount is stipulated in the following space, in which case liquidated damages shall be determined at \_\_\_\_\_ dollars (\$ \_\_\_\_\_) per calendar day.



Numbers in margin correspond to " Checklist", DCM Form B-

(13) **SPECIAL PROVISIONS** *(Insert any Special Provisions here, such as acceptance or rejection of unit prices. If Special Provisions are continued in an attachment, identify the attachment below):*

(14) **STATE GENERAL CONTRACTOR'S LICENSE:** The Contractor does hereby certify that Contractor is currently licensed by the Alabama State Licensing Board for General Contractors and that the certificate for such license bears the following:

License No.:

Classification(s):

Bid Limit:

The Owner and Contractor have entered into this Construction Contract as of the date first written above and have executed this Construction Contract in sufficient counterparts to enable each contracting party to have an originally executed Construction Contract each of which shall, without proof or accounting for the other counterparts, be deemed an original thereof.

The Owner does hereby certify that this Construction Contract was let in accordance with the provisions of Title 39, Code of Alabama 1975, as amended, and all other applicable provisions of law, and that the terms and commitments of this Construction Contract do not constitute a debt of the State of Alabama in violation of Article 11, Section 213 of the Constitution of Alabama, 1901, as amended by Amendment Number 26.

(15)

**APPROVAL**

**ALABAMA STATE DEPARTMENT OF EDUCATION  
(SDE)**  
*(Required for locally-funded, SDE projects.)*

By \_\_\_\_\_ Date: \_\_\_\_\_  
State Superintendent of Education

**CONTRACTING PARTIES**

\_\_\_\_\_  
Contractor Company

By \_\_\_\_\_  
Signature

Name & Title \_\_\_\_\_

\_\_\_\_\_  
Owner Entity

By \_\_\_\_\_  
Signature

Name(s) & Title(s) \_\_\_\_\_

*Routing of the Construction Contract to reviewers and e-signers is automated through DocuSign. DocuSign links for fully locally-funded contract documents are available from DCM's Engage Portal at <https://engagealabama-rpm.facilityforce.cloud>*

Numbers in margin correspond to second page of " Checklist", DCM Form B-

# (1) PERFORMANCE BOND

SURETY'S BOND NUMBER
----------------------

*Do not staple this form; use clips.*

(2) The **PRINCIPAL** (*Company name and address of Contractor as appears in the Construction Contract*)

Name:  
Address:

(3) The **SURETY** (*Company name and primary place of business*)

Name:  
Address:

(4) The **OWNER** (*Entity name and address, same as appears in the Construction Contract*)

Name:  
Address:

(5) The **PENAL SUM** of this Bond (the Contract Sum)

Dollars (\$) \_\_\_\_\_).

(6) **DATE** of the Construction Contract :

(7) The **PROJECT**: (*Same as appears in the Construction Contract*)

**1. WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above for the performance of the Contract, and Contract Change Orders, in accord with the requirements of the Contract Documents, which are incorporated herein by reference. If the Contractor performs the Contract, and Contract Change Orders, in accordance with the Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

**2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders.** All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

3. Whenever the Architect gives the Contractor and the Surety, at their addresses stated above, a written Notice to Cure a condition for which the Contract may be terminated in accordance with the Contract Documents, the Surety may, within the time stated in the notice, cure or provide the Architect with written verification that satisfactory positive action is in process to cure the condition.
4. The Surety's obligation under this Bond becomes effective after the Contractor fails to satisfy a Notice to Cure and the Owner:
  - (a) gives the Contractor and the Surety, at their addresses stated above, a written Notice of Termination declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the notice; and
  - (b) gives the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation under this Bond.
5. In the presence of the conditions described in Paragraph 4, the Surety shall, at its expense:
  - (a) On the effective date of the Notice of Termination, take charge of the Work and be responsible for the safety, security, and protection of the Work, including materials and equipment stored on and off the Project site, and
  - (b) Within twenty-one days after the effective date of the Notice of Termination, proceed, or provide the Owner with written verification that satisfactory positive action is in process to facilitate proceeding promptly, to complete the Work in accordance with the Contract Documents, either with the Surety's resources or through a contract between the Surety and a qualified contractor to whom the Owner has no reasonable objection.
6. As conditions precedent to taking charge of and completing the Work pursuant to Paragraph 5, the Surety shall neither require, nor be entitled to, any agreements or conditions other than those of this Bond and the Contract Documents. In taking charge of and completing the Work, the Surety shall assume all rights and obligations of the Contractor under the Contract Documents; however, the Surety shall also have the right to assert "Surety Claims" to the Owner in accordance with the Contract Documents. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to promptly take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.
7. By accepting this Bond as a condition of executing the Construction Contract, and by taking the actions described in Paragraph 4, the Owner agrees that:
  - (a) the Owner shall promptly advise the Surety of the unpaid balance of the Contract Sum and, upon request, shall make available or furnish to the Surety, at the cost of reproduction, any portions of the Project Record, and
  - (b) as the Surety completes the Work, or has it completed by a qualified contractor, the Owner shall pay the Surety, in accordance with terms of payment of the Contract Documents, the unpaid balance of the Contract Sum, less any amounts that may be or become due the Owner from the Contractor under the Construction Contract or from the Contractor or the Surety under this Bond.
8. In the presence of the conditions described in Paragraph 4, the Surety's obligation includes responsibility for the correction of Defective Work, liquidated damages, and reimbursement of any reasonable expenses incurred by the Owner as a result of the Contractor's default under the Contract, including architectural, engineering, administrative, and legal services.

Numbers in margin correspond to second page of " Checklist", DCM Form B-

9. Nothing contained in this Bond shall be construed to mean that the Surety shall be liable to the Owner for an amount exceeding the Penal Sum of this Bond, except in the event that the Surety should be in default under the Bond by failing or refusing to take charge of and complete the Work pursuant to Paragraph 5. If the Surety should fail or refuse to take charge of and complete the Work, the Owner shall have the authority to take charge of and complete the Work, or have it completed, and the following costs to the Owner, less the unpaid balance of the Contract Sum, shall be recoverable under this Bond:

- (a) the cost of completing the Contractor's responsibilities under the Contract, including correction of Defective Work;
- (b) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to completing the Work;
- (c) interest on, and the cost of obtaining, funds to supplement the unpaid balance of the Contract Sum as may be necessary to cover the foregoing costs;
- (d) the fair market value of any reductions in the scope of the Work necessitated by insufficiency of the unpaid balance of the Contract Sum and available supplemental funds to cover the foregoing costs; and
- (f) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to ascertaining and collecting the Owner's losses under the Bond.

10. All claims and disputes arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

(8) **SIGNED AND SEALED** this \_\_\_\_\_ day of \_\_\_\_\_.

(9 & 10)

**SURETY:**

**CONTRACTOR as PRINCIPAL:**

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Company Name

By \_\_\_\_\_  
Signature

By \_\_\_\_\_  
Signature

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Name and Title

(11) **NOTE:** Original power of attorney for the Surety's signatory shall be furnished with each of the original three bond forms to be attached to each of the three contract copies (with original signatures) per project.

Do not staple this form; use clips. Purpose: quickly and efficiently scan thousands of documents into DCM's database.

Numbers in margin correspond to second page of " Checklist", DCM Form B-

# (1) PAYMENT BOND

SURETY'S BOND NUMBER

*Do not staple this form; use clips.*

(2) The **PRINCIPAL** (*Company name and address of Contractor, same as appears in the Construction Contract*)

Name:

Address:

(3) The **SURETY** (*Company name and primary place of business*)

Name:

Address:

(4) The **OWNER(s)** (*Entity name and address, same as appears in the Construction Contract*)

Name:

Address:

(5) The **PENAL SUM** of this Bond (the Contract Sum)

Dollars (\$) \_\_\_\_\_).

(6) **DATE** of the Construction Contract:

(7) The **PROJECT**: (*Same as appears in the Construction Contract*)

1. **WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above to promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract, which is incorporated herein by reference, and any modifications thereof by Contract Change Orders. If the Contractor and its Subcontractors promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders, then this obligation shall be null and void; otherwise to remain and be in full force and effect.

2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

Numbers in margin correspond to second page of " Checklist", DCM Form B-

3. Any person that has furnished labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders for which payment has not been timely made may institute a civil action upon this Bond and have their rights and claims adjudicated in a civil action and judgment entered thereon. Notwithstanding the foregoing, a civil action may not be instituted on this bond until 45 days after written notice to the Surety of the amount claimed to be due and the nature of the claim. The civil action must commence not later than one year from the date of final settlement of the Contract. The giving of notice by registered or certified mail, postage prepaid, addressed to the Surety at any of its places of business or offices shall be deemed sufficient. In the event the Surety or Contractor fails to pay the claim in full within 45 days from the mailing of the notice, then the person or persons may recover from the Contractor and Surety, in addition to the amount of the claim, a reasonable attorney's fee based on the result, together with interest on the claim from the date of the notice.
4. Every person having a right of action on this bond shall, upon written application to the Owner indicating that labor, material, or supplies for the Work have been supplied and that payment has not been made, be promptly furnished a certified copy of this bond and the Construction Contract. The claimant may bring a civil action in the claimant's name on this Bond against the Contractor and the Surety, or either of them, in the county in which the Work is to be or has been performed or in any other county where venue is otherwise allowed by law.
5. This bond is furnished to comply with Code of Alabama, §39-1-1, and all provisions thereof shall be applicable to civil actions upon this bond.
6. All claims and disputes between Owner and either the Contractor or Surety arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

(8) **SIGNED AND SEALED** this \_\_\_\_\_ day of \_\_\_\_\_.

(9 & 10) **SURETY:**

**CONTRACTOR as PRINCIPAL:**

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Company Name

By \_\_\_\_\_  
Signature

By \_\_\_\_\_  
Signature

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Name and Title

(11) **NOTE:** Original power of attorney for the Surety's signatory shall be furnished with each of the original three bond forms to be attached to each of the three contract copies (with original signatures) per project.

Do not staple this form; use clips. Purpose: quickly and efficiently scan thousands of documents into DCM's database.



ALABAMA DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management

www.dcm.alabama.gov, 334-242-4082, inspections@realproperty.alabama.gov

Revised December 2021

Department Use Only
Invoice#
Date Paid
Confirmation #

PERMIT FEE & PERMIT RE-INSPECTION FEE CALCULATON WORKSHEET

DCM (BC) #
Date
Project Name; Owner/Architect/Engineer Project # & Phase/Package #
Owner Entity Name
Architect/Engineer Firm Name
Contractor Company Name
Select only ONE of the following:
Basic Permit Fee. Fee is based on awarded contract sum.
Permit Re-Inspection Flat Fee.
Awarded Contract Sum:
Email address(es) for Payment Receipt:

BASIC PERMIT FEE CALCULATION:

Awarded Contract Sum s less than \$1,000: N/A

Awarded Contract Sum is \$1,001 - \$50,000:

Contract Sum or Shelter Estimate I \$1,000= /1,000 \$5.00= +\$15.00=

Awarded Contract Sum s \$50,001 \$100,000:

Contract Sum or Shelter Estimate I \$50,000= /1,000 \$4.00= +\$260.00=

Awarded Contract Sum s \$100,001 - \$500,000:

Contract Sum or Shelter Estimate \$100,000= /1,000 \$3.00= +\$460.00=

Awarded Contract Sum is \$500,001 and up:

Contract Sum or Shelter Estimate less \$500,000= /1,000 \$2.00= +\$1,660.00=

PERMIT RE-INSPECTION FEE:

Flat fee of \$1,500.00 per occurrence

TOTAL DUE:

Basic Permit Fee: Covers all required pre-construction conferences, construction inspections and certificate of substantial completion issuance by the DCM Inspector. This fee is due when a construction contract or self-performance letter is received by DCM and must be paid before the required Pre-Construction Conference is scheduled with the DCM Inspector.

Permit Re-Inspection Fee: May be charged if (A) the contractor has not completed the work required for the particular inspection as detailed in DCM Form B-8: Pre-Construction Conference Checklist, or (B) the inspection is canceled or rescheduled without the required minimum 48 hours notice to all parties.

Make check payable to: "Finance - Construction Management," include the DCM (BC) Project # on the check and attach the fee worksheet. Mail payment to: Finance - Construction Management, P.O. Box 301150, Montgomery, AL 36130-1150.

State agency inter-fund transfer and payments using Public School and College Authority (PSCA) funds: contact Jennie Jones at 334-242-4808 or jennie.jones@realproperty.alabama.gov.

Fees may be paid online at www.dcm.alabama.gov (in which case a completed fee worksheet is not required).

The Basic Permit Fee is subject to Final Reconciliation of Fees at the end of construction.



# State of Alabama Disclosure Statement

Required by Article 3B of Title 41, Code of Alabama 1975

ENTITY COMPLETING FORM

ADDRESS

CITY, STATE, ZIP

TELEPHONE NUMBER

STATE AGENCY/DEPARTMENT THAT WILL RECEIVE GOODS, SERVICES, OR IS RESPONSIBLE FOR GRANT AWARD

ADDRESS

CITY, STATE, ZIP

TELEPHONE NUMBER

This form is provided with:

- Contract   
 Proposal   
 Request for Proposal   
 Invitation to Bid   
 Grant Proposal

Have you or any of your partners, divisions, or any related business units previously performed work or provided goods to any State Agency/Department in the current or last fiscal year?

- Yes   
 No

If yes, identify below the State Agency/Department that received the goods or services, the type(s) of goods or services previously provided, and the amount received for the provision of such goods or services.

Have you or any of your partners, divisions, or any related business units previously applied and received any grants from any State Agency/Department in the current or last fiscal year?

- Yes   
 No

If yes, identify the State Agency/Department that awarded the grant, the date such grant was awarded, and the amount of the grant.

1. List below the name(s) and address(es) of all public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)



2. List below the name(s) and address(es) of all family members of public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the public officials/public employees and State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF FAMILY MEMBER	ADDRESS	NAME OF PUBLIC OFFICIAL/ PUBLIC EMPLOYEE	STATE DEPARTMENT/ AGENCY WHERE EMPLOYED

If you identified individuals in items one and/or two above, describe in detail below the direct financial benefit to be gained by the public officials, public employees, and/or their family members as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

Describe in detail below any indirect financial benefits to be gained by any public official, public employee, and/or family members of the public official or public employee as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

List below the name(s) and address(es) of all paid consultants and/or lobbyists utilized to obtain the contract, proposal, request for proposal, invitation to bid, or grant proposal:

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*By signing below, I certify under oath and penalty of perjury that all statements on or attached to this form are true and correct to the best of my knowledge. I further understand that a civil penalty of ten percent (10%) of the amount of the transaction, not to exceed \$10,000.00, is applied for knowingly providing incorrect or misleading information.*

\_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Notary's Signature Date Date Notary Expires

Article 3B of Title 41, Code of Alabama 1975 requires the disclosure statement to be completed and filed with all proposals, bids, contracts, or grant proposals to the State of Alabama in excess of \$5,000.



Kay Ivey  
Governor

Bill Poole  
Director of Finance

STATE OF ALABAMA  
DEPARTMENT OF FINANCE  
REAL PROPERTY MANAGEMENT  
Division of Construction Management

P.O. Box 301150, Montgomery, AL 36130-1150  
770 Washington Avenue, Suite 444, Montgomery, AL 36104  
Telephone: (334) 242-4082 Fax: (334) 242-4182



Mickey Allen  
Assistant Finance Director  
Real Property Management

Frank Barnes, Director  
Construction Management

## E-Verify Memorandum of Understanding

Instructions for inclusion in project manuals.

Per DCM's May 29, 2012 bulletin *Guidance on Act 2012-491 Amending the Alabama Immigration Law*: "Contractors (including architects and engineers) will ... be required to enroll in the E-Verify program and to provide documentation of enrollment in the E-Verify program with their contracts or agreements."

Upon completing enrollment in the E-Verify program available at <https://www.e-verify.gov/employers/enrolling-in-e-verify>, an E-Verify Memorandum of Understanding (MOU) is issued to the enrolled business. The same E-Verify MOU can be repeatedly used until any information in the business's E-Verify user profile is updated, at which time E-Verify updates the printable Company Information section of the MOU, while the original signatory information remains the same. Typically, an E-Verify MOU is 13-18 pages long depending on business type and number of employees.

**DCM requires a copy of the entire current E-Verify MOU document including the completed Department of Homeland Security – Verification Division section (with name, signature and date included) to be submitted as an attachment to each Construction Contract original and to each Agreement Between Owner and Architect original.**

**ARTICLE 37**  
**CONTRACTOR'S and SUBCONTRACTORS' INSURANCE**

*(Provide entire Article 37 to Contractor's insurance representative.)*

**A. GENERAL**

**(1) RESPONSIBILITY.** The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

**(2) INSURANCE PROVIDERS.** Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

**(3) NOTIFICATION ENDORSEMENT.** Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

**(4) INSURANCE CERTIFICATES.** The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract. The insurance certificate must provide the following:

- (a) Name and address of authorized agent of the insurance company
- (b) Name and address of insured
- (c) Name of insurance company or companies
- (d) Description of policies
- (e) Policy Number(s)
- (f) Policy Period(s)
- (g) Limits of liability
- (h) Name and address of Owner as certificate holder
- (i) Project Name and Number, if any
- (j) Signature of authorized agent of the insurance company
- (k) Telephone number of authorized agent of the insurance company
- (l) Mandatory thirty day notice of cancellation / non-renewal / change

**(5) MAXIMUM DEDUCTIBLE.** Self-insured retention, except for qualified self-insurers or

group self-insurers, in any policy shall not exceed \$25,000.00.

**B. INSURANCE COVERAGES**

Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability limits not less than as follows:

**(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE**

(a) Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims.

(b) Employer's Liability Insurance limits shall be at least:

- .1 Bodily Injury by Accident - \$1,000,000 each accident
- .2 Bodily Injury by Disease - \$1,000,000 each employee

**(2) COMMERCIAL GENERAL LIABILITY INSURANCE**

(a) Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

<u>Coverage</u>	<u>Limit</u>
.1 General Aggregate	\$ 2,000,000.00 per Project
.2 Products, Completed Operations Aggregate	\$ 2,000,000.00 per Project
.3 Personal and Advertising Injury	\$ 1,000,000.00 per Occurrence
.4 Each Occurrence	\$ 1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

- .1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.
- .2 The policy must include separate per project aggregate limits.

**(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE**

(a) Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than \$1,000,000 Combined Single Limits for each occurrence.

(b) The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.

**(4) COMMERCIAL UMBRELLA OR COMMERCIAL EXCESS LIABILITY INSURANCE**

(a) Commercial Umbrella or Commercial Excess Liability Insurance to provide excess

coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.

(b) Minimum Combined Primary Commercial General Liability and Commercial Umbrella or Commercial Excess Limits of:

- .1 \$ 5,000,000 per Occurrence
- .2 \$ 5,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella or Commercial Excess Liability Insurance:

- .1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.
- .2 The policy must be on an "occurrence" basis.

## (5) **BUILDER'S RISK INSURANCE**

(a) The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss - Special Form (current edition as of the date of Advertisement for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.

(b) The policy shall be endorsed as follows:

"The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

- (i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or
- (ii) Partial or complete occupancy by Owner; or
- (iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

Exception: projects containing only abatement and/or only demolition do not require Builder's Risk insurance, unless required by the Owner. Note: projects containing any scope of work besides abatement and/or demolition require Builder's Risk insurance.

## C. **SUBCONTRACTORS' INSURANCE**

(1) **WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE.** The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph B, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.

(2) **LIABILITY INSURANCE.** The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella or Excess Liability Insurance coverages similar to those described in preceding Paragraph B. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.

(3) **ENFORCEMENT RESPONSIBILITY.** The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of insurance for any Subcontractor.

**D. TERMINATION of OBLIGATION to INSURE**

Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

**(1) BUILDER'S RISK INSURANCE.** The obligation to insure under Subparagraph B(5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

**(2) PRODUCTS and COMPLETED OPERATIONS.** The obligation to carry Products and Completed Operations coverage specified under Subparagraph B(2) shall remain in effect for two years after the Date(s) of Substantial Completion.

**(3) ALL OTHER INSURANCE.** The obligation to carry other insurance coverages specified under Subparagraphs B(1) through B(4) and Paragraph C shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

**E. WAIVERS of SUBROGATION**

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work.

# GENERAL CONDITIONS of the CONTRACT

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## ARTICLE 1 DEFINITIONS

Whenever the following terms, or pronouns in place of them, are used in the Contract Documents, the intent and meaning shall be interpreted as follows:

- A. ALABAMA DIVISION OF CONSTRUCTION MANAGEMENT:** The Technical Staff of the Alabama Division of Construction Management.
- B. ARCHITECT:** The Architect is the person or entity lawfully licensed to practice architecture in the State of Alabama, who is under contract with the Owner as the primary design professional for the Project and identified as the Architect in the Construction Contract. The term "Architect" means the Architect or the Architect's authorized representative. If the employment of the Architect is terminated, the Owner shall employ a new Architect whose status under the Contract Documents shall be that of the former Architect. If the primary design professional for the Project is a Professional Engineer, the term "Engineer" shall be substituted for the term "Architect" wherever it appears in this document.

- C. COMMISSION:** The former Alabama Building Commission, for which the Alabama Division of Construction Management has been designated by the Legislature as its successor.
- D. CONTRACT:** The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:
- (1) Construction Contract
  - (2) Performance and Payment Bonds
  - (3) Conditions of the Contract (General, Supplemental, and other Conditions)
  - (4) Specifications
  - (5) Drawings
  - (6) Contract Change Orders
  - (7) Modifications to the Construction Contract (applicable to PSCA Projects)
- E. CONTRACT SUM:** The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term “Contract Sum” means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.
- F. CONTRACT TIME:** The Contract Time is the period of time in which the Contractor must achieve Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner or Director. The Date of Substantial Completion is the date established in accordance with Article 32. The term “Contract Time” means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.
- G. CONTRACTOR:** The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity, identified as such in the Construction Contract. The term “Contractor” means the Contractor or the Contractor’s authorized representative.
- H. DCM:** The Alabama Division of Construction Management.
- I. DCM PROJECT INSPECTOR:** The member of the Technical Staff of the Alabama Division of Construction Management to whom the Project is assigned relative to executing the respective inspections and authorities described in Article 16, Inspection of the Work.
- J. DEFECTIVE WORK:** The term “Defective Work” shall apply to: (1) any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, (2) in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, (3) substitutions and deviations not properly submitted and approved or otherwise authorized, (4) temporary



supports, structures, or construction which will not produce the results required by the Contract Documents, and (5) materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.

- K. DIRECTOR:** The Director of the Alabama Division of Construction Management.
- L. DRAWINGS:** The Drawings are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.
- M. NOTICE TO PROCEED:** A proceed order issued by the Owner or Director, as applicable, fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.
- N1 OWNER:** The Owner is the entity or entities identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term “Owner” means the Owner or the Owner’s authorized representative. The term “Owner” as used herein shall be synonymous with the term “Awarding Authority”.
- N2 AWARDING AUTHORITY:** §39-2-1 (1) of the Code of Alabama, 1975, as amended definition: Any governmental board, commission, agency, body, authority, instrumentality, department, or subdivision of the state, its counties and municipalities. This term includes, but shall not be limited to, the Department of Transportation, the Division of Real Property Management of the Department of Finance, the State Board of Education, and any other entity contracting for public works. This term shall exclude the State Docks Department and any entity exempted from the competitive bid laws of the state by statute.
- O. THE PROJECT:** The Project is the total construction of which the Work required by these Contract Documents may be the entirety or only a part with other portions to be constructed by the Owner or separate contractors.
- P. PROJECT MANUAL:** The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.
- Q. SPECIFICATIONS:** The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.
- R. SUBCONTRACTOR:** A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term “Subcontractor” means a Subcontractor or its authorized representatives.
- S. THE WORK:** The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor’s obligations under the Contract. The Work may constitute the entire Project or only a portion of it.

**ARTICLE 2**  
**INTENT and INTERPRETATION of the CONTRACT DOCUMENTS**

**A. INTENT**

It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

**B. COMPLEMENTARY DOCUMENTS**

The Contract Documents are complementary. If Work is required by one Contract Document, the Contractor shall perform the Work as if it were required by all of the Contract Documents. However, the Contractor shall be required to perform Work only to the extent that is consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

**C. ORDER of PRECEDENCE**

Should any discrepancy arise between the various elements of the Contract Documents, precedence shall be given to them in the following order unless to do so would contravene the apparent Intent of the Contract Documents stated in preceding Paragraph A:

- (1) The Construction Contract.
- (2) Addenda, with those of later date having precedence over those of earlier date.
- (3) Supplementary Conditions (or other Conditions which modify the General Conditions of the Contract).
- (4) General Conditions of the Contract.
- (5) The Specifications.
- (6) Details appearing on the Drawings; large scale details shall take precedence over smaller scale details.
- (7) The Drawings; large scale drawings shall take precedence over smaller scale drawings.

**D. ORGANIZATION**

Except as may be specifically stated within the technical specifications, neither the organization of the Specifications into divisions, sections, or otherwise, nor any arrangement of the Drawings shall control how the Contractor subcontracts portions of the Work or assigns Work to any trade.

**E. INTERPRETATION**

- (1) The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the Intent of the Contract Documents stated in preceding Paragraph A. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as “Not In Contract” (“N.I.C.”), the Contractor’s obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor’s expense to produce a product or system

that is complete, appropriately tested, and in operative condition ready for use or subsequent construction or operation of the Owner or separate contractors. The omission of words or phrases for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

(2) Words or phrases used in the Contract Documents which have well-known technical or construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

(3) Except as noted otherwise, references to standard specifications or publications of associations, bureaus, or organizations shall mean the latest edition of the referenced standard specification or publication as of the date of the Advertisement for Bids.

(4) In the case of inconsistency between Drawings and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

(5) Any portions of the Contract Documents written in longhand must be initialed by all parties..

(6) Any doubt as to the meaning of the Contract Documents or any obscurity as to the wording of them, shall be promptly submitted in writing to the Architect for written interpretation, explanation, or clarification.

**F. SEVERABILITY**

The partial or complete invalidity of any one or more provision of this Contract shall not affect the validity or continuing force and effect of any other provision.

**ARTICLE 3**  
**CONTRACTOR'S REPRESENTATIONS**

By executing the Construction Contract the Contractor represents to the Owner:

- A. The Contractor has visited the site of the Work to become familiar with local conditions under which the Work is to be performed and to evaluate reasonably observable conditions as compared with requirements of the Contract Documents.
- B. The Contractor shall use its best skill and attention to perform the Work in an expeditious manner consistent with the Contract Documents.
- C. The Contractor is an independent contractor and in performance of the Contract remains and shall act as an independent contractor having no authority to represent or obligate the Owner in any manner unless authorized by the Owner in writing.

**ARTICLE 4**  
**DOCUMENTS FURNISHED to CONTRACTOR**

Unless otherwise provided in the Contract Documents, twenty sets of Drawings and Project Manuals will be furnished to the Contractor by the Architect without charge. Other copies requested will be furnished at reproduction cost.

## **ARTICLE 5** **OWNERSHIP of DRAWINGS**

All original or duplicated Drawings, Specifications, and other documents prepared by the Architect, and furnished to the Contractor are the property of the Architect and are to be used solely for this Project and not to be used in any manner for other work. Upon completion of the Work, all copies of Drawings and Specifications, with the exception of the Contractor's record set, shall be returned or accounted for by the Contractor to the Architect, on request.

## **ARTICLE 6** **SUPERVISION, SUPERINTENDENT, and EMPLOYEES**

### **A. SUPERVISION and CONSTRUCTION METHODS**

- (1) The term "Construction Methods" means the construction means, methods, techniques, sequences, and procedures utilized by the Contractor in performing the Work. The Contractor is solely responsible for supervising and coordinating the performance of the Work, including the selection of Construction Methods, unless the Contract Documents give other specific instructions concerning these matters.
- (2) The Contractor is solely and completely responsible for job site safety, including the protection of persons and property in accordance with Article 14.
- (3) The Contractor shall be responsible to the Owner for acts and omissions of not only the Contractor and its agents and employees, but all persons and entities, and their agents and employees, who are performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.
- (4) The Contractor shall be responsible to inspect the in-progress and completed Work to verify its compliance with the Contract Documents and to insure that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work.

### **B. SUPERINTENDENT**

- (1) The Contractor shall employ and maintain a competent level of supervision for the performance of the Work at the Project site, including a superintendent who shall:
  - (a) have full authority to receive instructions from the Architect or Owner and to act on those instructions and
  - (b) be present at the Project site at all times during which Work is being performed.
- (2) Before beginning performance of the Work, the Contractor shall notify the Architect in writing of the name and qualifications of its proposed superintendent so that the Owner may review

the individual's qualifications. If, for reasonable cause, the Owner refuses to approve the individual, or withdraws its approval after once giving it, the Contractor shall name a different superintendent for the Owner's review and approval. Any disapproved superintendent will not perform in that capacity thereafter at the Project site.

**C. EMPLOYEES**

The Contractor shall permit only fit and skilled persons to perform the Work. The Contractor shall enforce safety procedures, strict discipline, and good order among persons performing the Work. The Contractor will remove from its employment on the Project any person who deliberately or persistently produces non-conforming Work or who fails or refuses to conform to reasonable rules of personal conduct contained in the Contract Documents or implemented by the Owner and delivered to the Contractor in writing during the course of the Work.

**ARTICLE 7**

**REVIEW of CONTRACT DOCUMENTS and FIELD CONDITIONS by CONTRACTOR**

- A.** In order to facilitate assembly and installation of the Work in accordance with the Contract Documents, before starting each portion of the Work, the Contractor shall examine and compare the relevant Contract Documents, and compare them to relevant field measurements made by the Contractor and any conditions at the site affecting that portion of the Work.
- B.** If the Contractor discovers any errors, omissions, or inconsistencies in the Contract Documents, the Contractor shall promptly report them to the Architect as a written request for information that includes a detailed statement identifying the specific Drawings or Specifications that are in need of clarification and the error, omission, or inconsistency discovered in them.
- (1)** The Contractor shall not be expected to act as a licensed design professional and ascertain whether the Contract Documents comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, but the Contractor shall be obligated to promptly notify the Architect of any such noncompliance discovered by or made known to the Contractor. If the Contractor performs Work without fulfilling this notification obligation, the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.
- (2)** The Contractor shall not be liable to the Owner for errors, omissions, or inconsistencies that may exist in the Contract Documents, or between the Contract Documents and conditions at the site, unless the Contractor knowingly fails to report a discovered error, omission, or inconsistency to the Architect, in which case the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.
- C.** If the Contractor considers the Architect's response to a request for information to constitute a change to the Contract Documents involving additional costs and/or time, the Contractor shall follow the procedures of Article 20, Claims for Extra Cost or Extra Work.
- D.** If, with undue frequency, the Contractor requests information that is obtainable through reasonable examination and comparison of the Contract Documents, site conditions, and previous correspondence, interpretations, or clarifications, the Contractor shall be liable to the Owner for reasonable charges from the Architect for the additional services required to review, research, and respond to such requests for information.

**ARTICLE 8**  
**SURVEYS by CONTRACTOR**

- A.** The Contractor shall provide competent engineering services to assure accurate execution of the Work in accordance with the Contract Documents. The Contractor shall verify the figures given for the contours, approaches and locations shown on the Drawings before starting any Work and be responsible for the accuracy of the finished Work. Without extra cost to the Owner, the Contractor shall engage a licensed surveyor if necessary to verify boundary lines, keep within property lines, and shall be responsible for encroachments on rights or property of public or surrounding property owners.
- B.** The Contractor shall establish all base lines for the location of the principal components of the Work and make all detail surveys necessary for construction, including grade stakes, batter boards and other working points, lines and elevations. If the Work involves alteration of or addition to existing structures or improvements, the Contractor shall locate and measure elements of the existing conditions as is necessary to facilitate accurate fabrication, assembly, and installation of new Work in the relationship, alignment, and/or connection to the existing structure or improvement as is shown in the Contract Documents.

**ARTICLE 9**  
**SUBMITTALS**

- A.** Where required by the Contract Documents, the Contractor shall submit shop drawings, product data, samples and other information (hereinafter referred to as Submittals) to the Architect for the purpose of demonstrating the way by which the Contractor proposes to conform to the requirements of the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.
- B.** The Contractor shall be responsible to the Owner for the accuracy of its Submittals and the conformity of its submitted information to the requirements of the Contract Documents. Each Submittal shall bear the Contractor's approval, evidencing that the Contractor has reviewed and found the information to be in compliance with the requirements of the Contract Documents. Submittals which are not marked as reviewed and approved by the Contractor may be returned by the Architect without action.
- C.** The Contractor shall prepare and deliver its submittals to the Architect sufficiently in advance of construction requirements and in a sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. In coordinating the Submittal process with its construction schedule, the Contractor shall allow sufficient time to permit adequate review by the Architect.
- D.** By approving a Submittal the Contractor represents not only that the element of Work presented in the Submittal complies with the requirements of the Contract Documents, but also that the Contractor has:
  - (1)** found the layout and/or dimensions in the Submittal to be comparable with those in the Contract Documents and other relevant Submittals and has made field measurements as necessary to verify their accuracy, and

- (2) determined that products, materials, systems, equipment and/or procedures presented in the Submittal are compatible with those presented, or being presented, in other relevant Submittals and with the Contractor's intended Construction Methods.
- E.** The Contractor shall not fabricate or perform any portion of the Work for which the Contract Documents require Submittals until the respective Submittals have been approved by the Architect.
- F.** In the case of a resubmission, the Contractor shall direct specific attention to all revisions in a Submittal. The Architect's approval of a resubmission shall not apply to any revisions that were not brought to the Architect's attention.
- G.** If the Contract Documents specify that a Submittal is to be prepared and sealed by a registered architect or licensed engineer retained by the Contractor, all drawings, calculations, specifications, and certifications of the Submittal shall bear the Alabama seal of registration and signature of the registered/licensed design professional who prepared them or under whose supervision they were prepared. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of such a Submittal, provided that all performance and design criteria that such Submittal must satisfy are sufficiently specified in the Contract Documents. The Architect will review, approve or take other appropriate action on such a Submittal only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria specified in the Contract Documents.

#### **H. DEVIATIONS**

(1) The Architect is authorized by the Owner to approve "minor" deviations from the requirements of the Contract Documents. "Minor" deviations are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Deviations which are not "minor" may be authorized only by the Owner through the Change Order procedures of Article 19.

(2) Any deviation from the requirements of the Contract Documents contained in a Submittal shall be clearly identified as a "Deviation from Contract Requirements" (or by similar language) within the Submittal and, in a letter transmitting the Submittal to the Architect, the Contractor shall direct the Architect's attention to, and request specific approval of, the deviation. Otherwise, the Architect's approval of a Submittal does not constitute approval of deviations from the requirements of the Contract Documents contained in the Submittal.

(3) The Contractor shall bear all costs and expenses of any changes to the Work, changes to work performed by the Owner or separate contractors, or additional services by the Architect required to accommodate an approved deviation unless the Contractor has specifically informed the Architect in writing of the required changes and a Change Order has been issued authorizing the deviation and accounting for such resulting changes and costs.

#### **I. ARCHITECT'S REVIEW and APPROVAL**

(1) The Architect will review the Contractor's Submittals for conformance with requirements of, and the design concept expressed in, the Contract Documents and will approve or take other appropriate action upon them. This review is not intended to verify the accuracy and completeness of details such as dimensions and quantities nor to substantiate installation instructions or

performance of equipment or systems, all of which remain the responsibility of the Contractor. However, the Architect shall advise the Contractor of any errors or omissions which the Architect may detect during this review. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

(2) The Architect will review and respond to all Submittals with reasonable promptness to avoid delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time to permit adequate review.

(3) No corrections or changes to Submittals indicated by the Architect will be considered as authorizations to perform Extra Work. If the Contractor considers such correction or change of a Submittal to require Work which differs from the requirements of the Contract Documents, the Contractor shall promptly notify the Architect in writing in accordance with Article 20, Claims for Extra Cost or Extra Work.

**J. CONFORMANCE with SUBMITTALS**

The Work shall be constructed in accordance with approved Submittals.

**ARTICLE 10**  
**DOCUMENTS and SAMPLES at the SITE**

**A. "AS ISSUED" SET**

The Contractor shall maintain at the Project site, in good order, at least one copy of all Addenda, Change Orders, supplemental drawings, written directives and clarifications, and approved Submittals intact as issued, and an updated construction schedule.

**B. "POSTED" SET**

The Contractor shall maintain at the Project site, in good order, at least one set of the Drawings and Project Manual into which the Contractor has "posted"(incorporated) all Addenda, Change Orders, supplemental drawings, clarifications, and other information pertinent to the proper performance of the Work. The Contractor shall assure that all sets of the Drawings and Project Manuals being used by the Contractor, Subcontractors, and suppliers are "posted" with the current information to insure that updated Contract Documents are used for performance of the Work.

**C. RECORD SET**

One set of the Drawings and Project Manual described in Paragraph B shall be the Contractor's record set in which the Contractor shall record all field changes, corrections, selections, final locations, and other information as will be duplicated on the "As-built" documents required under Article 11. The Contractor shall record such "as-built" information in its record set as it becomes available through progress of the Work. The Contractor's performance of this requirement shall be subject to confirmation by the Architect at any time as a prerequisite to approval of Progress Payments.

**D.** The documents and samples required by this Article to be maintained at the Project site shall be readily available to the Architect, Owner, DCM Project Inspector, and their representatives.



**ARTICLE 11**  
**“AS-BUILT” DOCUMENTS**

- A.** Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets of “As-built” documents, as described herein, to the Architect for submission to the Owner upon completion of the Work. Each set of “As-built” documents shall consist of a copy of the Drawings and Project Manual, in like-new condition, into which the Contractor has neatly incorporated all Addenda, Change Orders, supplemental drawings, clarifications, field changes, corrections, selections, actual locations of underground utilities, and other information as required herein or specified elsewhere in the Contract Documents.
- B.** The Contractor shall use the following methods for incorporating information into the “As-built” documents:
- (1) Drawings**
- (a)** To the greatest extent practicable, information shall be carefully drawn and lettered, in ink, on the Drawings in the form of sketches, details, plans, notes, and dimensions as required to provide a fully dimensioned record of the Work. When required for clarity, sketches, details, or partial plans shall be drawn on supplemental sheets and bound into the Drawings and referenced on the drawing being revised.
- (b)** Where a revised drawing has been furnished by the Architect, the drawing of latest date shall be bound into the Drawings in the place of the superseded drawing.
- (c)** Where a supplemental drawing has been furnished by the Architect, the supplemental drawing shall be bound into the Drawings in an appropriate location and referred to by notes added to the drawing being supplemented.
- (d)** Where the Architect has furnished details, partial plans, or lengthy notes of which it would be impractical for the Contractor to redraw or letter on a drawing, such information may be affixed to the appropriate drawing with transparent tape if space is available on the drawing.
- (e)** Any entry of information made in the Drawings that is the result of an Addendum or Change Order, shall identify the Addendum or Change Order from which it originated.
- (2) Project Manual**
- (a)** A copy of all Addenda and Change Orders, excluding drawings thereof, shall be bound in the front of the Project Manual.
- (b)** Where a document, form, or entire specification section is revised, the latest issue shall be bound into the Project Manual in the place of the superseded issue.
- (c)** Where information within a specification section is revised, the deleted or revised information shall be drawn through in ink and an adjacent note added identifying the Addendum or Change Order containing the revised information.
- C.** Within ten days after the Date of Substantial Completion of the Work, or the last completed portion of the Work, the Contractor shall submit the “As-built” documents to the Architect for approval. If the Architect requires that any corrections be made, the documents will be returned in a reasonable time for correction and resubmission.

**ARTICLE 12**  
**PROGRESS SCHEDULE**

(Not applicable if the Contract Time is 60 days or less.)

- A. The Contractor shall within fifteen days after the date of commencement stated in the Notice to Proceed, or such other time as may be provided in the Contract Documents, prepare and submit to the Architect for review and approval a practicable construction schedule informing the Architect and Owner of the order in which the Contractor plans to carry on the Work within the Contract Time. The Architect's review and approval of the Contractor's construction schedule shall be only for compliance with the specified format, Contract Time, and suitability for monitoring progress of the Work and shall not be construed as a representation that the Architect has analyzed the schedule to form opinions of sequences or durations of time represented in the schedule.
- B. If a schedule format is not specified elsewhere in the Contract Documents, the construction schedule shall be prepared using DCM Form C-11, "Sample Progress Schedule and Report", (contained in the Project Manual) or similar format of suitable scale and detail to indicate the percentage of Work scheduled to be completed at the end of each month. At the end of each month the Contractor shall enter the actual percentage of completion on the construction schedule submit two copies to the Architect, and attach one copy to each copy of the monthly Application for Payment. The construction schedule shall be revised to reflect any agreed extensions of the Contract Time or as required by conditions of the Work.
- C. If a more comprehensive schedule format is specified elsewhere in the Contract Documents or voluntarily employed by the Contractor, it may be used in lieu of DCM Form C-11.
- D. The Contractor's construction schedule shall be used by the Contractor, Architect, and Owner to determine the adequacy of the Contractor's progress. The Contractor shall be responsible for maintaining progress in accordance with the currently approved construction schedule and shall increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant and equipment as may be necessary to do so. If the Contractor's progress falls materially behind the currently approved construction schedule and, in the opinion of the Architect or Owner, the Contractor is not taking sufficient steps to regain schedule, the Architect may, with the Owner's concurrence, issue the Contractor a Notice to Cure pursuant to Article 27. In such a Notice to Cure the Architect may require the Contractor to submit such supplementary or revised construction schedules as may be deemed necessary to demonstrate the manner in which schedule will be regained.

**ARTICLE 13**  
**EQUIPMENT, MATERIALS, and SUBSTITUTIONS**

- A. Every part of the Work shall be executed in a workmanlike manner in accordance with the Contract Documents and approved Submittals. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise.
- B. Whenever a product, material, system, item of equipment, or service is identified in the Contract Documents by reference to a trade name, manufacturer's name, model number, etc.(hereinafter

referred to as “source”), and only one or two sources are listed, or three or more sources are listed and followed by “or approved equal” or similar wording, it is intended to establish a required standard of performance, design, and quality, and the Contractor may submit, for the Architect’s approval, products, materials, systems, equipment, or services of other sources which the Contractor can prove to the Architect’s satisfaction are equal to, or exceed, the standard of performance, design and quality specified, unless the provisions of Paragraph D below apply. Such proposed substitutions are not to be purchased or installed without the Architect’s written approval of the substitution.

- C. If the Contract Documents identify three or more sources for a product, material, system, item of equipment or service to be used and the list of sources is not followed by “or approved equal” or similar wording, the Contractor may make substitution only after evaluation by the Architect and execution of an appropriate Contract Change Order.
- D. If the Contract Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the Contractor must furnish the identified sole source.

#### **ARTICLE 14** **SAFETY and PROTECTION of PERSONS and PROPERTY**

- A. The Contractor shall be solely and completely responsible for conditions at the Project site, including safety of all persons (including employees) and property. The Contractor shall create, maintain, and supervise conditions and programs to facilitate and promote safe execution of the Work, and shall supervise the Work with the attention and skill required to assure its safe performance. Safety provisions shall conform to OSHA requirements and all other federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. Nothing contained in this Contract shall be construed to mean that the Owner has employed the Architect nor has the Architect employed its consultants to administer, supervise, inspect, or take action regarding safety programs or conditions at the Project site.
- B. The Contractor shall employ Construction Methods, safety precautions, and protective measures that will reasonably prevent damage, injury or loss to:
  - (1) workers and other persons on the Project site and in adjacent and other areas that may be affected by the Contractor’s operations;
  - (2) the Work and materials and equipment to be incorporated into the Work and stored by the Contractor on or off the Project site; and
  - (3) other property on, or adjacent to, the Project site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and other improvements not designated in the Contract Documents to be removed, relocated, or replaced.
- C. The Contractor shall be responsible for the prompt remedy of damage and loss to property, including the filing of appropriate insurance claims, caused in whole or in part by the fault or negligence of the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

- D.** The Contractor shall comply with and give notices required by applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety and protection of persons or property, including without limitation notices to adjoining property owners of excavation or other construction activities that potentially could cause damage or injury to adjoining property or persons thereon.
- E.** The Contractor shall erect and maintain barriers, danger signs, and any other reasonable safeguards and warnings against hazards as may be required for safety and protection during performance of the Contract and shall notify owners and users of adjacent sites and utilities of conditions that may exist or arise which may jeopardize their safety.
- F.** If use or storage of explosives or other hazardous materials or equipment or unusual Construction Methods are necessary for execution of the Work, the Contractor shall exercise commensurate care and employ supervisors and workers properly qualified to perform such activity.
- G.** The Contractor shall furnish a qualified safety representative at the Project site whose duties shall include the prevention of accidents. The safety representative shall be the Contractor's superintendent, unless the Contractor assigns this duty to another responsible member of its on-site staff and notifies the Owner and Architect in writing of such assignment.
- H.** The Contractor shall not permit a load to be applied, or forces introduced, to any part of the construction or site that may cause damage to the construction or site or endanger safety of the construction, site, or persons on or near the site.
- I.** The Contractor shall have the right to act as it deems appropriate in emergency situations jeopardizing life or property. The Contractor shall be entitled to equitable adjustment of the Contract Sum or Contract Time for its efforts expended for the sole benefit of the Owner in an emergency. Such adjustment shall be determined as provided in Articles 19 and 20.
- J.** The duty of the Architect and the Architect's consultants to visit the Project site to conduct periodic inspections of the Work or for other purposes shall not give rise to a duty to review or approve the adequacy of the Contractor's safety program, safety supervisor, or any safety measure which Contractor takes or fails to take in, on, or near the Project site.

## **ARTICLE 15** **HAZARDOUS MATERIALS**

- A.** A Hazardous Material is any substance or material identified as hazardous under any federal, state, or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing its handling, disposal, and/or clean-up. Existing Hazardous Materials are Hazardous Materials discovered at the Project site and not introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable.
- B.** If, during the performance of the Work, the Contractor encounters a suspected Existing Hazardous Material, the Contractor shall immediately stop work in the affected area, take measures appropriate to the condition to keep people away from the suspected Existing Hazardous Material, and immediately notify the Architect and Owner of the condition in writing.

- C. The Owner shall obtain the services of an independent laboratory or professional consultant, appropriately licensed and qualified, to determine whether the suspected material is a Hazardous Material requiring abatement and, if so, to certify after its abatement that it has been rendered harmless. Any abatement of Existing Hazardous Materials will be the responsibility of the Owner. The Owner will advise the Contractor in writing of the persons or entities who will determine the nature of the suspected material and those who will, if necessary, perform the abatement. The Owner will not employ persons or entities to perform these services to whom the Contractor or Architect has reasonable objection.
- D. After certification by the Owner's independent laboratory or professional consultant that the material is harmless or has been rendered harmless, work in the affected area shall resume upon written agreement between the Owner and Contractor. If the material is found to be an Existing Hazardous Material and the Contractor incurs additional cost or delay due to the presence and abatement of the material, the Contract Sum and/or Contract Time shall be appropriately adjusted by a Contract Change Order pursuant to Article 19.
- E. The Owner shall not be responsible for Hazardous Materials introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable unless such Hazardous Materials were required by the Contract Documents.

**ARTICLE 16**  
**INSPECTION of the WORK**

**A. GENERAL**

(1) The Contractor is solely responsible for the Work's compliance with the Contract Documents; therefore, the Contractor shall be responsible to inspect in-progress and completed Work, and shall verify its compliance with the Contract Documents and that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work. Neither the presence nor absence of inspections by the Architect, Owner, Director, DCM Project Inspector, any public authority having jurisdiction, or their representatives shall relieve the Contractor of responsibility to inspect the Work, for responsibility for Construction Methods and safety precautions and programs in connection with the Work, or from any other requirement of the Contract Documents.

(2) The Architect, Owner, Director, DCM Project Inspector, any public authority having jurisdiction, and their representatives shall have access at all times to the Work for inspection whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection. All materials, workmanship, processes of manufacture, and methods of construction, if not otherwise stipulated in the Contract Documents, shall be subject to inspection, examination, and test at any and all places where such manufacture and/or construction are being carried on. Such inspections will not unreasonably interfere with the Contractor's operations.

(3) The Architect will inspect the Work as a representative of the Owner. The Architect's inspections may be supplemented by inspections by the DCM Project Inspector as a representative of the Alabama Division of Construction Management.

(4) The Contractor may be charged by the Owner for any extra cost of inspection incurred by the

Owner or Architect on account of material and workmanship not being ready at the time of inspection set by the Contractor.

**B. TYPES of INSPECTIONS**

**(1) SCHEDULED INSPECTIONS and CONFERENCES.** Scheduled Inspections and Conferences are conducted by the Architect, scheduled by the Architect in coordination with the Contractor and DCM Project Inspector, and are attended by the Contractor and applicable Subcontractors, suppliers and manufacturers, and the DCM Project Inspector. Scheduled Inspections and Conferences of this Contract include:

**(a) Pre-construction Conference.**

**(b) Pre-roofing Conference** (not applicable if the Contract involves no roofing work)

**(c) Above Ceiling Inspection(s):** An above ceiling inspection of all spaces in the building is required before the ceiling material is installed. Above ceiling inspections are to be conducted at a time when all above ceiling systems are complete and tested to the greatest extent reasonable pending installation of the ceiling material. System identifications and markings are to be complete. All fire-rated construction including fire-stopping of penetrations and specified identification above the ceiling shall be complete. Ceiling framing and suspension systems shall be complete with lights, grilles and diffusers, access panels, fire protection drops for sprinkler heads, etc., installed in their final locations to the greatest extent reasonable. Above ceiling framing to support ceiling mounted equipment shall be complete. The above ceiling construction shall be complete to the extent that after the inspection the ceiling material can be installed without disturbance.

**(d) Final Inspection(s):** A Final Inspection shall establish that the Work, or a designated portion of the Work, is Substantially Complete in accordance with Article 32 and is accepted by the Architect, Owner, and DCM Project Inspector as being ready for the Owner's occupancy or use. At the conclusion of this inspection, items requiring correction or completion ("punch list" items) shall be minimal and require only a short period of time for accomplishment to establish Final Acceptance of the Work. If the Work, or designated portion of the Work, includes the installation, or modification, of a fire alarm system or other life safety systems essential to occupancy, such systems shall have been tested and appropriately certified before the Final Inspection.

**(e) Year-end Inspection(s):** An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one year warranty period(s). The subsequent delivery of the Architect's report of this inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period in accordance with Article 35.

**(2) PERIODIC INSPECTIONS.** Periodic Inspections are conducted throughout the course of the Work by the Architect, the Architect's consultants, their representatives, and the DCM Project Inspector, jointly or independently, with or without advance notice to the Contractor.

**(3) SPECIFIED INSPECTIONS and TESTS.** Specified Inspections and Tests include inspections, tests, demonstrations, and approvals that are either specified in the Contract Documents or required by laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction, to be performed by the Contractor, one of its Subcontractors, or an independent testing laboratory or firm (whether paid for by the Contractor or Owner).

**C. INSPECTIONS by the ARCHITECT**

- (1) The Architect is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents (other than “minor” deviations as defined in Article 9 and “minor” changes as defined in Article 19), to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner.
- (2) The Architect will visit the site at intervals appropriate to the stage of the Contractor’s operations and as otherwise necessary to:
  - (a) become generally familiar with the in-progress and completed Work and the quality of the Work,
  - (b) determine whether the Work is progressing in general accordance with the Contractor’s schedule and is likely to be completed within the Contract Time,
  - (c) visually compare readily accessible elements of the Work to the requirements of the Contract Documents to determine, in general, if the Contractor’s performance of the Work indicates that the Work will conform to the requirements of the Contract Documents when completed,
  - (d) endeavor to guard the Owner against Defective Work,
  - (e) review and address with the Contractor any problems in implementing the requirements of the Contract Documents that the Contractor may have encountered, and
  - (f) keep the Owner fully informed about the Project.
- (3) The Architect shall have the authority to reject Defective Work or require its correction, but shall not be required to make exhaustive investigations or examinations of the in-progress or completed portions of the Work to expose the presence of Defective Work. However, it shall be an obligation of the Architect to report in writing, to the Owner, Contractor, and DCM Project Inspector, any Defective Work recognized by the Architect.
- (4) The Architect shall have the authority to require the Contractor to stop work only when, in the Architect’s reasonable opinion, such stoppage is necessary to avoid Defective Work. The Architect shall not be liable to the Contractor or Owner for the consequences of any decisions made by the Architect in good faith either to exercise or not to exercise this authority.
- (5) “Inspections by the Architect” includes appropriate inspections by the Architect’s consultants as dictated by their respective disciplines of design and the stage of the Contractor’s operations.

**D. INSPECTIONS by the DCM PROJECT INSPECTOR**

- (1) The DCM Project Inspector will:
  - (a) participate in scheduled inspections and conferences as practicable,
  - (b) perform periodic inspections of in-progress and completed Work to ensure code compliance of the Project and general conformance of the Work with the Contract Documents, and
  - (c) monitor the Contractor's progress and performance of the Work.
- (2) The DCM Project Inspector shall have the authority to:
  - (a) reject Work that is not in compliance with the State Building Code adopted by the DCM, unless the Work is in accordance with the Contract Documents in which case the DCM Project Inspector will advise the Architect to initiate appropriate corrective action, and
  - (b) notify the Architect, Owner, and Contractor of Defective Work recognized by the DCM Project Inspector.

(3) The DCM Project Inspector's periodic inspections will usually be scheduled around key stages of construction based upon information reported by the Architect. As the Architect or Owner deems appropriate, the DCM Project Inspector, as well as other members of the Technical Staff, can be requested to schedule special inspections or meetings to address specific matters. The written findings of DCM Project Inspector will be transmitted to the Owner, Contractor, and Architect.

(4) The DCM Project Inspector is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents, to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner. The Contractor shall not proceed with Work as a result of instructions or findings of the DCM Project Inspector which the Contractor considers to be a change to the requirements of the Contract Documents without written authorization of the Owner through the Architect.

**E. UNCOVERING WORK**

(1) If the Contractor covers a portion of the Work before it is examined by the Architect and this is contrary to the Architect's request or specific requirements in the Contract Documents, then, upon written request of the Architect, the Work must be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

(2) Without a prior request or specific requirement that Work be examined by the Architect before it is covered, the Architect may request that Work be uncovered for examination and the Contractor shall uncover it. If the Work is in accordance with the Contract Documents, the Contract Sum shall be equitably adjusted under Article 19 to compensate the Contractor for the costs of uncovering and replacement. If the Work is not in accordance with the Contract Documents, uncovering, correction, and replacement shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

**F. SPECIFIED INSPECTIONS and TESTS**

(1) The Contractor shall schedule and coordinate Specified Inspections and Tests to be made at appropriate times so as not to delay the progress of the Work or the work of the Owner or separate contractors. If the Contract Documents require that a Specified Inspection or Test be witnessed or attended by the Architect or Architect's consultant, the Contractor shall give the Architect timely notice of the time and place of the Specified Inspection or Test. If a Specified Inspection or Test reveals that Work is not in compliance with requirements of the Contract Documents, the Contractor shall bear the costs of correction, repeating the Specified Inspection or Test, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services. Through appropriate Contract Change Order the Owner shall bear costs of tests, inspections or approvals which become Contract requirements subsequent to the receipt of bids.

(2) If the Architect, Owner, or public authority having jurisdiction determines that inspections, tests, demonstrations, or approvals in addition to Specified Inspections and Tests are required, the Contractor shall, upon written instruction from the Architect, arrange for their performance by an entity acceptable to the Owner, giving timely notice to the architect of the time and place of their performance. Related costs shall be borne by the Owner unless the procedures reveal that Work is



not in compliance with requirements of the Contract Documents, in which case the Contractor shall bear the costs of correction, repeating the procedures, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services.

(3) Unless otherwise required by the Contract Documents, required certificates of Specified Inspections and Tests shall be secured by the Contractor and promptly delivered to the Architect.

(4) Failure of any materials to pass Specified Inspections and Tests will be sufficient cause for refusal to consider any further samples of the same brand or make of that material for use in the Work.

## **ARTICLE 17** **CORRECTION of DEFECTIVE WORK**

- A. The Contractor shall, at the Contractor's expense, promptly correct Defective Work rejected by the Architect or which otherwise becomes known to the Contractor, removing the rejected or nonconforming materials and construction from the project site.
- B. Correction of Defective Work shall be performed in such a timely manner as will avoid delay of completion, use, or occupancy of the Work and the work of the Owner and separate contractors.
- C. The Contractor shall bear all expenses related to the correction of Defective Work, including but not limited to: (1) additional testing and inspections, including repeating Specified Inspections and Tests, (2) reasonable services and expenses of the Architect, and (3) the expense of making good all work of the Contractor, Owner, or separate contractors destroyed or damaged by the correction of Defective Work.

## **ARTICLE 18** **DEDUCTIONS for UNCORRECTED WORK**

If the Owner deems it advisable and in the Owner's interest to accept Defective Work, the Owner may allow part or all of such Work to remain in place, provided an equitable deduction from the Contract Sum, acceptable to the Owner, is offered by the Contractor.

## **ARTICLE 19** **CHANGES in the WORK**

### **A. GENERAL**

(1) The Owner may at any time direct the Contractor to make changes in the Work which are within the general scope of the Contract, including changes in the Drawings, Specifications, or other portions of the Contract Documents to add, delete, or otherwise revise portions of the Work. The Architect is authorized by the Owner to direct "minor" changes in the Work by written order to the Contractor. "Minor" changes in the Work are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Changes in the Work which are not "minor" may be

authorized only by the Owner.

(2) If the Owner directs a change in the Work, the change shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract, stating their agreement upon the change or changes in the Work and the adjustments, if any, in the Contract Sum and the Contract Time.

(3) Subject to compliance with Alabama's Public Works Law, the Owner may, upon agreement by the Contractor, incorporate previously unawarded bid alternates into the Contract.

(4) In the event of a claim or dispute as to the appropriate adjustment to the Contract Sum or Contract Time due to a directive to make changes in the Work, the Work shall proceed as provided in this article subject to subsequent agreement of the parties or final resolution of the dispute pursuant to Article 24.

(5) Consent of surety will be obtained for all Contract Change Orders involving an increase in the Contract Sum.

(6) Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly to perform changes in the Work, unless otherwise directed by the Owner through the Architect.

(7) All change orders require DCM Form C-12: Contract Change Order and DCM Form B-11: Change Order Justification. Only Change Orders 10% or greater of the current contract amount require the Owner's legal advisor's signature on DCM Form B-11: Change Order Justification.

## **B. DETERMINATION of ADJUSTMENT of the CONTRACT SUM**

The adjustment of the Contract Sum resulting from a change in the Work shall be determined by one of the following methods, or a combination thereof, as selected by the Owner:

(1) **Lump Sum.** By mutual agreement to a lump sum based on or negotiated from an itemized cost proposal from the Contractor. Additions to the Contract Sum shall include the Contractor's direct costs plus a maximum 15% markup for overhead and profit. Where subcontract work is involved the total mark-up for the Contractor and a Subcontractor shall not exceed 25%. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

(2) **Unit Price.** By application of Unit Prices included in the Contract or subsequently agreed to by the parties. However, if the character or quantity originally contemplated is materially changed so that application of such unit price to quantities of Work proposed will cause substantial inequity to either party, the applicable unit price shall be equitably adjusted.

(3) **Force Account.** By directing the Contractor to proceed with the change in the Work on a "force account" basis under which the Contractor shall be reimbursed for reasonable expenditures incurred by the Contractor and its Subcontractors in performing added Work and the Owner shall

receive reasonable credit for any deleted Work. The Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting of the cost of the change together with sufficient supporting data. Unless otherwise stated in the directive, the adjustment of the Contract Sum shall be limited to the following:

- (a) costs of labor and supervision, including employee benefits, social security, retirement, unemployment and workers' compensation insurance required by law, agreement, or under Contractor's or Subcontractor's standard personnel policy;
- (b) cost of materials, supplies and equipment, including cost of delivery, whether incorporated or consumed;
- (c) rental cost of machinery and equipment, not to exceed prevailing local rates if contractor-owned;
- (d) costs of premiums for insurance required by the Contract Documents, permit fees, and sales, use or similar taxes related to the change in the Work;
- (e) reasonable credits to the Owner for the value of deleted Work, without Contractor or Subcontractor mark-ups; and
- (f) for additions to the Contract Sum, mark-up of the Contractor's direct costs for overhead and profit not exceeding 15% on Contractor's work nor exceeding 25% for Contractor and Subcontractor on a Subcontractor's work. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of insurance other than mentioned above, bonds, superintendent and other job office personnel, watchman, use and rental of small tools, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

### **C. ADJUSTMENT of the CONTRACT TIME due to CHANGES**

(1) Unless otherwise provided in the Contract Documents, the Contract Time shall be equitably adjusted for the performance of a change provided that the Contractor notifies the Architect in writing that the change will increase the time required to complete the Work. Such notice shall be provided no later than:

- (a) with the Contractor's cost proposal stating the number of days of extension requested, or
- (b) within ten days after the Contractor receives a directive to proceed with a change in advance of submitting a cost proposal, in which case the notice should provide an estimated number of days of extension to be requested, which may be subject to adjustment in the cost proposal.

(2) The Contract Time shall be extended only to the extent that the change affects the time required to complete the entire Work of the Contract, taking into account the concurrent performance of the changed and unchanged Work.

### **D. CHANGE ORDER PROCEDURES**

(1) If the Owner proposes to make a change in the Work, the Architect will request that the Contractor provide a cost proposal for making the change to the Work. The request shall be in writing and shall adequately describe the proposed change using drawings, specifications, narrative, or a combination thereof. Within 21 days after receiving such a request, or such other time as may be stated in the request, the Contractor shall prepare and submit to the Architect a written proposal, properly itemized and supported by sufficient substantiating data to facilitate evaluation. The stated

time within which the Contractor must submit a proposal may be extended if, within that time, the Contractor makes a written request with reasonable justification thereof.

(2) The Contractor may voluntarily offer a change proposal which, in the Contractor's opinion, will reduce the cost of construction, maintenance, or operation or will improve the cost-effective performance of an element of the Project, in which case the Owner, through the Architect, will accept, reject, or respond otherwise within 21 days after receipt of the proposal, or such other reasonable time as the Contractor may state in the proposal.

(3) If the Contractor's proposal is acceptable to the Owner, or is negotiated to the mutual agreement of the Contractor and Owner, the Architect will prepare an appropriate Contract Change Order for execution. Upon receipt of the fully executed Contract Change Order, the Contractor shall proceed with the change.

(4) In advance of delivery of a fully executed Contract Change Order, the Architect may furnish to the Contractor a written authorization to proceed with an agreed change. However, such an authorization shall be effective only if it:

- (a) identifies the Contractor's accepted or negotiated proposal for the change,
- (b) states the agreed adjustments, if any, in Contract Sum and Contract Time,
- (c) states that funds are available to pay for the change, and
- (d) is signed by the Owner.

(5) If the Contractor and Owner cannot agree on the amount of the adjustment in the Contract Sum for a change, the Owner, through the Architect, may order the Contractor to proceed with the change on a Force Account basis, but the net cost to the Owner shall not exceed the amount quoted in the Contractor's proposal. Such order shall state that funds are available to pay for the change.

(6) If the Contractor does not promptly respond to a request for a proposal, or the Owner determines that the change is essential to the final product of the Work and that the change must be effected immediately to avoid delay of the Project, the Owner may:

- (a) determine with the Contractor a sufficient maximum amount to be authorized for the change and
- (b) direct the Contractor to proceed with the change on a Force Account basis pending delivery of the Contractor's proposal, stating the maximum increase in the Contract Sum that is authorized for the change.

(7) Pending agreement of the parties or final resolution of any dispute of the total amount due the Contractor for a change in the Work, amounts not in dispute for such changes in the Work may be included in Applications for Payment accompanied by an interim Change Order indicating the parties' agreement with part of all of such costs or time extension. Once a dispute is resolved, it shall be implemented by preparation and execution of an appropriate Change Order.

## **ARTICLE 20**

### **CLAIMS for EXTRA COST or EXTRA WORK**

- A. If the Contractor considers any instructions by the Architect, Owner, DCM Project Inspector, or public authority having jurisdiction to be contrary to the requirements of the Contract Documents and will involve extra work and/or cost under the Contract, the Contractor shall give the Architect

written notice thereof within ten days after receipt of such instructions, and in any event before proceeding to execute such work. As used in this Article, “instructions” shall include written or oral clarifications, directions, instructions, interpretations, or determinations.

- B.** The Contractor’s notification pursuant to Paragraph 20.A shall state: (1) the date, circumstances, and source of the instructions, (2) that the Contractor considers the instructions to constitute a change to the Contract Documents and why, and (3) an estimate of extra cost and time that may be involved to the extent an estimate may be reasonably made at that time.
- C.** Except for claims relating to an emergency endangering life or property, no claim for extra cost or extra work shall be considered in the absence of prior notice required under Paragraph 20.A.
- D.** Within ten days of receipt of a notice pursuant to Paragraph 20.A, the Architect will respond in writing to the Contractor, stating one of the following:
  - (1) The cited instruction is rescinded.
  - (2) The cited instruction is a change in the Work and in which manner the Contractor is to proceed with procedures of Article 19, Changes in the Work.
  - (3) The cited instruction is reconfirmed, is not considered by the Architect to be a change in the Contract Documents, and the Contractor is to proceed with Work as instructed.
- E.** If the Architect’s response to the Contractor is as in Paragraph 20.D(3), the Contractor shall proceed with the Work as instructed. If the Contractor continues to consider the instructions to constitute a change in the Contract Documents, the Contractor shall, within ten days after receiving the Architect’s response, notify the Architect in writing that the Contractor intends to submit a claim pursuant to Article 24, Resolution of Claims and Disputes

## **ARTICLE 21**

### **DIFFERING SITE CONDITIONS**

#### **A. DEFINITION**

**“Differing Site Conditions” are:**

- (1) subsurface or otherwise concealed physical conditions at the Project site which differ materially from those indicated in the Contract Documents, or
- (2) unknown physical conditions at the Project site which are of an unusual nature, differing materially from conditions ordinarily encountered and generally recognized as inherent in construction activities of the character required by the Contract Documents.

#### **B. PROCEDURES**

If Differing Site Conditions are encountered, then the party discovering the condition shall promptly notify the other party before the condition is disturbed and in no event later than ten days after discovering the condition. Upon such notice and verification that a Differing Site Condition exists, the Architect will, with reasonable promptness and with the Owner’s concurrence, make changes in the Drawings and/or Specifications as are deemed necessary to conform to the Differing

Site Condition. Any increase or decrease in the Contract Sum or Contract Time that is warranted by the changes will be made as provided under Article 19, Changes in the Work. If the Architect determines a Differing Site Condition has not been encountered, the Architect shall notify the Owner and Contractor in writing, stating the reason for that determination.

## **ARTICLE 22** **CLAIMS for DAMAGES**

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time after the discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

## **ARTICLE 23** **DELAYS**

- A.** A delay beyond the Contractor's control at any time in the commencement or progress of Work by an act or omission of the Owner, Architect, or any separate contractor or by labor disputes, unusual delay in deliveries, unavoidable casualties, fires, abnormal floods, tornadoes, or other cataclysmic events of nature, may entitle the Contractor to an extension of the Contract Time provided, however, that the Contractor shall, within ten days after the delay first occurs, give written notice to the Architect of the cause of the delay and its probable effect on progress of the entire Work.
- B.** Adverse weather conditions that are more severe than anticipated for the locality of the Work during any given month may entitle the Contractor to an extension of Contract Time provided, however;
- (1)** the weather conditions had an adverse effect on construction scheduled to be performed during the period in which the adverse weather occurred, which in reasonable sequence would have an effect on completion of the entire Work,
  - (2)** the Contractor shall, within twenty-one days after the end of the month in which the delay occurs, give the Architect written notice of the delay that occurred during that month and its probable effect on progress of the Work, and
  - (3)** within a reasonable time after giving notice of the delay, the Contractor provides the Architect with sufficient data to document that the weather conditions experienced were unusually severe for the locality of the Work during the month in question. Unless otherwise provided in the Contract Documents, data documenting unusually severe weather conditions shall compare actual weather conditions to the average weather conditions for the month in question during the previous five years as recorded by the National Oceanic and Atmospheric Administration (NOAA) or similar record-keeping entities.
- C.** Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual

written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.

- D. The Contractor shall not be entitled to any adjustment of the Contract Sum for damage due to delays claimed pursuant to this Article unless the delay was caused by the Owner or Architect and was either:
- (1) the result of bad faith or active interference or
  - (2) beyond the contemplation of the parties and not remedied within a reasonable time after notification by the Contractor of its presence.

## **ARTICLE 24** **RESOLUTION of CLAIMS and DISPUTES**

### **A. APPLICABILITY of ARTICLE**

(1) As used in this Article, “Claims and Disputes” include claims or disputes asserted by the Contractor, its Surety, or Owner arising out of or related to the Contract, or its breach, including without limitation claims seeking, under the provisions of the Contract, equitable adjustment of the Contract Sum or Contract Time and claims and disputes arising between the Contractor (or its Surety) and Owner regarding interpretation of the Contract Documents, performance of the Work, or breach of or compliance with the terms of the Contract.

(2) “Resolution” addressed in this Article applies only to Claims and Disputes arising between the Contractor (or its Surety) and Owner and asserted after execution of the Construction Contract and prior to the date upon which final payment is made. Upon making application for final payment the Contractor may reserve the right to subsequent Resolution of existing Claims by including a list of all Claims, in stated amounts, which remain to be resolved and specifically excluding them from any release of claims executed by the Contractor, and in that event Resolution may occur after final payment is made.

### **B. CONTINUANCE of PERFORMANCE**

An unresolved Claim or Dispute shall not be just cause for the Contractor to fail or refuse to proceed diligently with performance of the Contract or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

### **C. GOOD FAITH EFFORT to SETTLE**

The Contractor and Owner agree that, upon the assertion of a Claim by the other, they will make a good faith effort, with the Architect’s assistance and advice, to achieve mutual resolution of the Claim. If mutually agreed, the Contractor and Owner may endeavor to resolve a Claim through mediation. If efforts to settle are not successful, the Claim shall be resolved in accordance with paragraph D or E below, whichever applies.

### **D. FINAL RESOLUTION for STATE-FUNDED CONTRACTS**

(1) If the Contract is funded in whole or in part with state funds, the final Resolution of Claims

and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner shall be by the Director, whose decision shall be final, binding, and conclusive upon the Contractor, its Surety, and the Owner.

(2) When it becomes apparent to the party asserting a Claim (the Claimant) that an impasse to mutual resolution has been reached, the Claimant may request in writing to the Director that the Claim be resolved by decision of the Director. Such request by the Contractor (or its Surety) shall be submitted through the Owner. Should the Owner fail or refuse to submit the Contractor's request within ten days of receipt of same, the Contractor may forward such request directly to the Director. Upon receipt of a request to resolve a Claim, the Director will instruct the parties as to procedures to be initiated and followed.

(3) If the respondent to a Claim fails or refuses to participate or cooperate in the Resolution procedures to the extent that the Claimant is compelled to initiate legal proceedings to induce the Respondent to participate or cooperate, the Claimant will be entitled to recover, and may amend its Claim to include, the expense of reasonable attorney's fees so incurred.

**E. FINAL RESOLUTION for LOCALLY-FUNDED CONTRACTS**

If the Contract is funded in whole with funds provided by a city or county board of education or other local governmental authority and the Contract Documents do not stipulate a binding alternative dispute resolution method, the final resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner may be by any legal remedy available to the parties. Alternatively, upon the written agreement of the Contractor (or its Surety) and the Owner, final Resolution of Claims and Disputes may be by submission to binding arbitration before a neutral arbitrator or panel or by submission to the Director in accordance with preceding Paragraph D.

**ARTICLE 25**  
**OWNER'S RIGHT to CORRECT DEFECTIVE WORK**

If the Contractor fails or refuses to correct Defective Work in a timely manner that will avoid delay of completion, use, or occupancy of the Work or work by the Owner or separate contractors, the Architect may give the Contractor written Notice to Cure the Defective Work within a reasonable, stated time. If within ten days after receipt of the Notice to Cure the Contractor has not proceeded and satisfactorily continued to cure the Defective Work or provided the Architect with written verification that satisfactory positive action is in process to cure the Defective Work, the Owner may, without prejudice to any other remedy available to the Owner, correct the Defective Work and deduct the actual cost of the correction from payment then or thereafter due to the Contractor.

**ARTICLE 26**  
**OWNER'S RIGHT to STOP or SUSPEND the WORK**

**A. STOPPING the WORK for CAUSE**

If the Contractor fails to correct Defective Work or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work, or any part of the Work, until the cause for the Owner's directive has been eliminated;



however, the Owner's right to stop the Work shall not be construed as a duty of the Owner to be exercised for the benefit of the Contractor or any other person or entity.

**B. SUSPENSION by the OWNER for CONVENIENCE**

(1) The Owner may, at any time and without cause, direct the Contractor in writing to suspend, delay or interrupt the Work, or any part of the Work, for a period of time as the Owner may determine.

(2) The Contract Sum and Contract Time shall be adjusted, pursuant to Article 19, for reasonable increases in the cost and time caused by an Owner-directed suspension, delay or interruption of Work for the Owner's convenience. However, no adjustment to the Contract Sum shall be made to the extent that the same or concurrent Work is, was or would have been likewise suspended, delayed or interrupted for other reasons not caused by the Owner.

**ARTICLE 27**  
**OWNER'S RIGHT to TERMINATE CONTRACT**

**A. TERMINATION by the OWNER for CAUSE**

(1) **Causes:** The Owner may terminate the Contractor's right to complete the Work, or any designated portion of the Work, if the Contractor:

- (a) should be adjudged bankrupt, or should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency to the extent termination for these reasons is permissible under applicable law;
- (b) refuses or fails to prosecute the Work, or any part of the Work, with the diligence that will insure its completion within the Contract Time, including any extensions, or fails to complete the Work within the Contract Time;
- (c) refuses or fails to perform the Work, including prompt correction of Defective Work, in a manner that will insure that the Work, when fully completed, will be in accordance with the Contract Documents;
- (d) fails to pay for labor or materials supplied for the Work or to pay Subcontractors in accordance with the respective Subcontract;
- (e) persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction, or the instructions of the Architect or Owner; or
- (f) is otherwise guilty of a substantial breach of the Contract.

(2) **Procedure for Unbonded Construction Contracts (Generally, contracts less than \$100,000):**

- (a) **Notice to Cure:** In the presence of any of the above conditions the Architect may give the Contractor written notice to cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.
- (b) **Notice of Termination:** If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor written notice that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the

written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a seven day Notice of Termination without giving the Contractor another Notice to Cure.

(d) At the expiration of the seven days of the termination notice, the Owner may:

.1 take possession of the site, of all materials and equipment stored on and off site, and of all Contractor-owned tools, construction equipment and machinery, and facilities located at the site, and

.2 finish the Work by whatever reasonable method the Owner may deem expedient.

(e) The Contractor shall not be entitled to receive further payment under the Contract until the Work is completed.

(f) If the Owner's cost of completing the Work, including correction of Defective Work, compensation for additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees due to the default and termination, is less than the unpaid balance of the Contract Sum, the excess balance less liquidated damages for delay shall be paid to the Contractor. If such cost to the Owner including attorney's fees, plus liquidated damages, exceeds the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner. Final Resolution of any claim or Dispute involving the termination or any amount due any party as a result of the termination shall be pursuant to Article 24.

(g) Upon the Contractor's request, the Owner shall furnish to the Contractor a detailed accounting of the Owner's cost of completing the Work.

**(3) Procedure for Bonded Construction Contracts (Generally, contracts of \$100,000 or more):**

(a) **Notice to Cure:** In the presence of any of the above conditions the Architect may give the Contractor and its Surety written Notice to Cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) **Notice of Termination:** If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor and its Surety written notice declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a Notice of Termination without giving the Contractor another Notice to Cure.

(d) **Demand on the Performance Bond:** With the Notice of Termination the Owner shall give the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation to take charge of and complete the Work in accordance with the terms of the Performance Bond.

(e) **Surety Claims:** Upon receiving the Owner's demand on the Performance Bond, the Surety shall assume all rights and obligations of the Contractor under the Contract. However, the Surety shall also have the right to assert "Surety Claims" to the Owner, which are defined as claims relating to acts or omissions of the Owner or Architect prior to termination of the Contractor which may have prejudiced its rights as Surety or its interest in the unpaid balance of the Contract Sum. If the Surety wishes to assert a Surety Claim, it shall give the Owner,

through the Architect, written notice within twenty-one days after first recognizing the condition giving rise to the Surety Claim. The Surety Claim shall then be submitted to the Owner, through the Architect, no later than sixty days after giving notice thereof, but no such Surety Claims shall be considered if submitted after the date upon which final payment becomes due. Final resolution of Surety Claims shall be pursuant to Article 24, Resolution of Claims and Disputes. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

**(f) Payments to Surety:** The Surety shall be paid for completing the Work in accordance with the Contract Documents as if the Surety were the Contractor. The Owner shall have the right to deduct from payments to the Surety any reasonable costs incurred by the Owner, including compensation for additional architectural, engineering, managerial, and administrative services, and attorneys' fees as necessitated by termination of the Contractor and completion of the Work by the Surety. No further payments shall be made to the Contractor by the Owner. The Surety shall be solely responsible for any accounting to the Contractor for the portion of the Contract Sum paid to Surety by Owner or for the costs and expenses of completing the Work.

**(4) Wrongful Termination:** If any notice of termination by the Owner for cause, made in good faith, is determined to have been wrongly given, such termination shall be effective and compensation therefore determined as if it had been a termination for convenience pursuant to Paragraph B below.

**B. TERMINATION by the OWNER for CONVENIENCE**

**(1)** The Owner may, without cause and at any time, terminate the performance of Work under the Contract in whole, or in part, upon determination by the Owner that such termination is in the Owner's best interest. Such termination is referred to herein as Termination for Convenience.

**(2)** Upon receipt of a written notice of Termination for Convenience from the Owner, the Contractor shall:

- (a)** stop Work as specified in the notice;
- (b)** enter into no further subcontracts or purchase orders for materials, services, or facilities, except as may be necessary for Work directed to be performed prior to the effective date of the termination or to complete Work that is not terminated;
- (c)** terminate all existing subcontracts and purchase orders to the extent they relate to the terminated Work;
- (d)** take such actions as are necessary, or directed by the Architect or Owner, to protect, preserve, and make safe the terminated Work; and
- (e)** complete performance of the Work that is not terminated.

**(3)** In the event of Termination for Convenience, the Contractor shall be entitled to receive payment for the Work performed prior to its termination, including materials and equipment purchased and delivered for incorporation into the terminated Work, and any reasonable costs incurred because of the termination. Such payment shall include reasonable mark-up of costs for overhead and profit, not to exceed the limits stated in Article 19, Changes in the Work. The Contractor shall be entitled to receive payment for reasonable anticipated overhead ("home office") and shall not be entitled to receive payment for any profits anticipated to have been gained from the terminated Work. A proposal for decreasing the Contract Sum shall be submitted to the Architect

by the Contractor in such time and detail, and with such supporting documentation, as is reasonably directed by the Owner. Final modification of the Contract shall be by Contract Change Order pursuant to Article 19. Any Claim or Dispute involving the termination or any amount due a party as a result shall be resolved pursuant to Article 24.

**ARTICLE 28**  
**CONTRACTOR'S RIGHT to SUSPEND or TERMINATE the CONTRACT**

**A. SUSPENSION by the OWNER**

If all of the Work is suspended or delayed for the Owner's convenience or under an order of any court, or other public authority, for a period of sixty days, through no act or fault of the Contractor or a Subcontractor, or anyone for whose acts they may be liable, then the Contractor may give the Owner a written Notice of Termination which allows the Owner fourteen days after receiving the Notice in which to give the Contractor appropriate written authorization to resume the Work. Absent the Contractor's receipt of such authorization to resume the Work, the Contract shall terminate upon expiration of this fourteen day period and the Contractor will be compensated by the Owner as if the termination had been for the Owner's convenience pursuant to Article 27.B.

**B. NONPAYMENT**

The Owner's failure to pay the undisputed amount of an Application for Payment within sixty days after receiving it from the Architect (Certified pursuant to Article 30) shall be just cause for the Contractor to give the Owner fourteen days' written notice that the Work will be suspended pending receipt of payment but that the Contract shall terminate if payment is not received within fourteen days (or a longer period stated by the Contractor) of the expiration of the fourteen day notice period.

(1) If the Work is then suspended for nonpayment, but resumed upon receipt of payment, the Contractor will be entitled to compensation as if the suspension had been by the Owner pursuant to Article 26, Paragraph B.

(2) If the Contract is then terminated for nonpayment, the Contractor will be entitled to compensation as if the termination had been by the Owner pursuant to Article 27, Paragraph B.

**ARTICLE 29**  
**PROGRESS PAYMENTS**

**A. FREQUENCY of PROGRESS PAYMENTS**

Unless otherwise provided in the Contract Documents, the Owner will make payments to the Contractor as the Work progresses based on monthly estimates prepared and certified by the Contractor, approved and certified by the Architect, and approved by the Owner and other authorities whose approval is required.

**B. SCHEDULE of VALUES**

Within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a DCM Form C-10SOV, Schedule of Values, which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall be printable on 8.5" × 11" and shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

### **C. APPLICATIONS for PAYMENTS**

(1) Based on the approved Schedule of Values, each DCM Form C-10, Application and Certificate for Payment shall show the Contractor's estimate of the value of Work performed in each line item as of the end of the billing period. The Contractor's cost of materials and equipment not yet incorporated into the Work, but delivered and suitably stored on the site, may be considered in monthly Applications for Payment. One payment application per month may be submitted. Each DCM Form C-10, Application and Certificate for Payment shall match to the penny and be accompanied by an attached DCM Form C-10SOV, Schedule of Values.

(2) The Contractor's estimate of the value of Work performed and stored materials must represent such reasonableness as to warrant certification by the Architect to the Owner in accordance with Article 30. Each monthly Application for Payment shall be supported by such data as will substantiate the Contractor's right to payment, including without limitation copies of requisitions from subcontractors and material suppliers.

(3) If no other date is stated in the Contract Documents or agreed upon by the parties, each Application for Payment shall be submitted to the Architect on or about the first day of each month and payment shall be issued to the Contractor within thirty days after an Application for Payment is Certified pursuant to Article 30 and delivered to the Owner.

(4) **The Applications for Payment of State Agency/Authority projects and Public School and College Authority (PSCA)-funded projects must be activated via the appropriate DocuSign link available from the [Engage Portal](#) on [DCM's website](#).**

### **D. MATERIALS STORED OFF SITE**

Unless otherwise provided in the Contract Documents, the Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off the site, may also be considered in monthly Applications for Payment under the following conditions:

- (1) the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location;
- (2) a Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party;
- (3) the Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate

inspection and verification of the presence of the materials or equipment by the Architect or Owner;

- (4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner; and
- (5) compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

**E. RETAINAGE**

(1) "Retainage" is defined as the money earned and, therefore, belonging to the Contractor (subject to final settlement of the Contract) which has been retained by the Owner conditioned on final completion and acceptance of all Work required by the Contract Documents. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work.

(2) In making progress payments the Owner shall retain five percent of the estimated value of Work performed and the value of the materials stored for the Work; but after retainage has been held upon fifty percent of the Contract Sum, no additional retainage will be withheld.

**F. CONTRACTOR'S CERTIFICATION**

(1) Each Application for Payment shall bear the Contractor's certification that, to the best of the Contractor's knowledge, information, and belief, the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payments were issued and payments received from the Owner and that the current payment shown in the Application for Payment has not yet been received.

(2) By making this certification the Contractor represents to the Architect and Owner that, upon receipt of previous progress payments from the Owner, the Contractor has promptly paid each Subcontractor, in accordance with the terms of its agreement with the Subcontractor, the amount due the Subcontractor from the amount included in the progress payment on account of the Subcontractor's Work and stored materials. The Architect and Owner may advise Subcontractors and suppliers regarding percentages of completion or amounts requested and/or approved in an Application for Payment on account of the Subcontractor's Work and stored materials.

**G. PAYMENT ESTABLISHES OWNERSHIP**

All material and Work covered by progress payments shall become the sole property of the Owner, but the Contractor shall not be relieved from the sole responsibility for the care and protection of material and Work upon which payments have been made and for the restoration of any damaged material and Work.

**ARTICLE 30**  
**CERTIFICATION and APPROVALS for PAYMENT**

- A. The Architect's review, approval, and certification of Applications for Payment shall be based on the Architect's general knowledge of the Work obtained through site visits and the information

provided by the Contractor with the Application. The Architect shall not be required to perform exhaustive examinations, evaluations, or estimates of the cost of completed or uncompleted Work or stored materials to verify the accuracy of amounts requested by the Contractor, but the Architect shall have the authority to adjust the Contractor's estimate when, in the Architect's reasonable opinion, such estimates are overstated or understated.

- B.** Within seven days after receiving the Contractor's monthly Application for Payment, or such other time as may be stated in the Contract Documents, the Architect will take one of the following actions:
- (1)** The Architect will approve and certify the Application as submitted and forward it to the Owner as a Certification for Payment for approval by the Owner (and other approving authorities, if any) and payment.
  - (2)** If the Architect takes exception to any amounts claimed by the Contractor and the Contractor and Architect cannot agree on revised amounts, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to certify to the Owner, transmitting a copy of same to the Contractor.
  - (3)** To the extent the Architect determines may be necessary to protect the Owner from loss on account of any of the causes stated in Article 31, the Architect may subtract from the Contractor's estimates and will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due and notify the Contractor and Owner in writing of the Architect's reasons for withholding payment in whole or in part.
- C.** Neither the Architect's issuance of a Certificate for Payment nor the Owner's resulting progress payment shall be a representation to the Contractor that the Work in progress or completed at that time is accepted or deemed to be in conformance with the Contract Documents.
- D.** The Architect shall not be required to determine that the Contractor has promptly or fully paid Subcontractors and suppliers or how or for what purpose the Contractor has used monies paid under the Construction Contract. However, the Architect may, upon request and if practical, inform any Subcontractor or supplier of the amount, or percentage of completion, approved or paid to the Contractor on account of the materials supplied or the Work performed by the Subcontractor.

### **ARTICLE 31** **PAYMENTS WITHHELD**

- A.** The Architect may nullify or revise a previously issued Certificate for Payment prior to Owner's payment thereunder to the extent as may be necessary in the Architect's opinion to protect the Owner from loss on account of any of the following causes not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:
- (1)** Defective Work;
  - (2)** filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;
  - (3)** the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;
  - (4)** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

- (5) damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;
  - (6) reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or
  - (7) the Contractor's persistent failure to conform to the requirements of the Contract Documents.
- B.** If the Owner deems it necessary to withhold payment pursuant to preceding Paragraph A, the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.
- C.** The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.
- (1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.
  - (2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.
- D.** The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.
- E.** The Owner shall have the right to withhold from payments due the Contractor under this Contract an amount equal to any amount which the Contractor owes the Owner under another contract.

## **ARTICLE 32**

### **SUBSTANTIAL COMPLETION**

- A.** Substantial Completion is the stage in the progress of the Work when the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items). Substantial Completion of the Work, or a designated portion of the Work, is not achieved until so agreed in a Certificate of Substantial Completion signed by the Contractor, Architect, Owner, and Technical Staff of the Alabama Division of Construction Management.
- B.** The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items



remaining to be completed or corrected for Final Acceptance prior to final payment.

- C. Substantial Completion is achieved and a Final Inspection is appropriate only when a minimal number of punch list items exists and only a short period of time will be required to correct or complete them. Upon receipt of the Contractor's notice for a Final Inspection, the Architect will advise the Contractor in writing of any conditions of the Work which the Architect or Owner is aware do not constitute Substantial Completion, otherwise, a Final Inspection will proceed within a reasonable time after the Contractor's notice is given. However, the Architect will not be required to prepare lengthy listings of punch list items; therefore, if the Final Inspection discloses that Substantial Completion has not been achieved, the Architect may discontinue or suspend the inspection until the Contractor does achieve Substantial Completion.

**D. CERTIFICATE of SUBSTANTIAL COMPLETION**

(1) When the Work or a designated portion of the Work is substantially complete, the Architect will prepare (via the appropriate DocuSign link available from the Engage Portal on DCM's website) and sign a Certificate of Substantial Completion to be signed in order by the Contractor, Owner, and Alabama Division of Construction Management.

(2) When signed by all parties, the Certificate of Substantial Completion shall establish the Date of Substantial Completion which is the date upon which:

- (a) the Work, or designated portion of the Work, is accepted by the Architect, Owner, and Alabama Division of Construction Management as being ready for occupancy,
- (b) the Contractor's one-year and special warranties for the Work covered by the Certificate commence, unless stated otherwise in the Certificate (the one-year warranty for punch list items completed or corrected after the period allowed in the Certificate shall commence on the date of their Final Acceptance), and
- (c) Owner becomes responsible for building security, maintenance, utility services, and insurance, unless stated otherwise in the Certificate.

(3) The Certificate of Substantial Completion shall set the time within which the Contractor shall finish all items on the "punch list" accompanying the Certificate. The completion of punch list items shall be a condition precedent to Final Payment.

(4) If the Work or designated portion covered by a Certificate of Substantial Completion includes roofing work, the General Contractor's (5-year) Roofing Guarantee, DCM Form C-9, must be executed by the Contractor and attached to the Certificate of Substantial Completion. If the Contract Documents specify any other roofing warranties to be provided by the roofing manufacturer, Subcontractor, or Contractor, they must also be attached to the Certificate of Substantial Completion. The Alabama Division of Construction Management will not sign the Certificate of Substantial Completion in the absence of the roofing guarantees.

- E. The Date of Substantial Completion of the Work, as set in the Certificate of Substantial Completion of the Work or of the last completed portion of the Work, establishes the extent to which the Contractor is liable for Liquidated Damages, if any; however, should the Contractor fail to complete all punch list items within thirty days, or such other time as may be stated in the respective Certificate of Substantial Completion, the Contractor shall bear any expenses, including additional Architectural services and expenses, incurred by the Owner as a result of such failure to complete punch list items in a timely manner.

**ARTICLE 33**  
**OCCUPANCY or USE PRIOR to COMPLETION**

**A. UPON SUBSTANTIAL COMPLETION**

Prior to completion of the entire Work, the Owner may occupy or begin utilizing any designated portion of the Work on the agreed Date of Substantial Completion of that portion of the Work.

**B. BEFORE SUBSTANTIAL COMPLETION**

(1) The Owner shall not occupy or utilize any portion of the Work before Substantial Completion of that portion has been achieved.

(2) The Owner may deliver furniture and equipment and store, or install it in place ready for occupancy and use, in any designated portion of the Work before it is substantially completed under the following conditions:

(a) The Owner's storage or installation of furniture and equipment will not unreasonably disrupt or interfere with the Contractor's completion of the designated portion of the Work.

(b) The Contractor consents to the Owner's planned action (such consent shall not be unreasonably withheld).

(c) The Owner shall be responsible for insurance coverage of the Owner's furniture and equipment, and the Contractor's liability shall not be increased.

(d) The Contractor, Architect, and Owner will jointly inspect and record the condition of the Work in the area before the Owner delivers and stores or installs furniture and equipment; the Owner will equitably compensate the Contractor for making any repairs to the Work that may subsequently be required due to the Owner's delivery and storage or installation of furniture and equipment.

(e) The Owner's delivery and storage or installation of furniture and equipment shall not be deemed an acceptance of any Work not completed in accordance with the requirements of the Contract Documents.

**ARTICLE 34**  
**FINAL PAYMENT**

**A. PREREQUISITES to FINAL PAYMENT**

The following conditions are prerequisites to Final Payment becoming due the Contractor:

(1) Full execution of a Certificate of Substantial Completion for the Work, or each designated portion of the Work.

(2) Final Acceptance of the Work.

(3) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements of the Contract Documents; such as delivery of "as-built" documents, operating and maintenance manuals, warranties, etc.

(4) Delivery to the Owner of a final Application for Payment, prepared by the Contractor and approved and certified by the Architect. Architect prepares DCM Form B-13: Final Payment Checklist and forwards it to the Owner along with the final Application for Payment.

(5) Completion of an Advertisement for Completion pursuant to Paragraph C below.

- (6) Delivery by the Contractor to the Owner through the Architect of DCM Form C-18: Contractor's Affidavit of Payment of Debts and Claims, and a Release of Claims, if any, and such other documents as may be required by Owner, satisfactory in form to the Owner pursuant to Paragraph D below.
- (7) Consent of Surety to Final Payment, if any, to Contractor. This Consent of Surety is required for projects which have Payment and Performance Bonds.
- (8) Delivery by the Contractor to the Architect and Owner of other documents, if any, required by the Contract Documents as prerequisites to Final Payment.
- (9) See Manual of Procedures Chapter 7, Section L.7 concerning reconciliation of contract time, if any.

**B. FINAL ACCEPTANCE of the WORK**

"Final Acceptance of the Work" shall be achieved when all "punch list" items recorded with the Certificate(s) of Substantial Completion are accounted for by either: (1) their completion or correction by the Contractor and acceptance by the Architect, Owner, and DCM Project Inspector, or (2) their resolution under Article 18, Deductions for Uncorrected Work.

**C. ADVERTISEMENT for COMPLETION**

(1) **If the Contract Sum is less than \$100,000:** Advertisement for Completion shall not apply to contractors performing contracts of less than \$100,000.00 in amount. §39-1-1(g)

(2) **If the Contract Sum is \$100,000 or more:** The Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion, similar to the sample contained in the Project Manual, published for a period of three weeks. The contractor can publish a notice in one or more of the following ways:

(a) In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.

(b) On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done. (c) On a website utilized by the awarding authority for publishing notices.

(d) If no newspaper is published in the county in which the work was done, and if the awarding authority does not utilize a website for the purpose of publishing notices, the notice may be given by posting at the courthouse for 30 days, and proof of the posting of the notice shall be given by the awarding authority and the contractor.

Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher or website owner and a printed copy of the notice published. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice.

**D. RELEASE of CLAIMS**

The Release of Claims and other documents referenced in Paragraph A(6) above are as follows:

(1) A release executed by Contractor of all claims and claims of lien against the Owner arising under and by virtue of the Contract, other than such claims of the Contractor, if any, as may have

been previously made in writing and as may be specifically excepted by the Contractor from the operation of the release in stated amounts to be set forth therein.

(2) An affidavit under oath, if required, stating that so far as the Contractor has knowledge or information, there are no claims or claims of lien which have been or will be filed by any Subcontractor, Supplier or other party for labor or material for which a claim or claim of lien could be filed.

(3) A release, if required, of all claims and claims of lien made by any Subcontractor, Supplier or other party against the Owner or unpaid Contract funds held by the Owner arising under or related to the Work on the Project; provided, however, that if any Subcontractor, Supplier or others refuse to furnish a release of such claims or claims of lien, the Contractor may furnish a bond executed by Contractor and its Surety to the Owner to provide an unconditional obligation to defend, indemnify and hold harmless the Owner against any loss, cost or expense, including attorney's fees, arising out of or as a result of such claims, or claims of lien, in which event Owner may make Final Payment notwithstanding such claims or claims of lien. If Contractor and Surety fail to fulfill their obligations to Owner under the bond, the Owner shall be entitled to recover damages as a result of such failure, including all costs and reasonable attorney's fees incurred to recover such damages.

#### **E. EFFECT of FINAL PAYMENT**

(1) The making of Final Payment shall constitute a waiver of Claims by the Owner except those arising from:

- (a) liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
- (b) failure of the Work to comply with the requirements of the Contract Documents;
- (c) terms of warranties or indemnities required by the Contract Documents, or
- (d) latent defects.

(2) Acceptance of Final Payment by the Contractor shall constitute a waiver of claims by Contractor except those previously made in writing, identified by Contractor as unsettled at the time of final Application for Payment, and specifically excepted from the release provided for in Paragraph D(1), above.

### **ARTICLE 35 CONTRACTOR'S WARRANTY**

#### **A. GENERAL WARRANTY**

The Contractor warrants to the Owner and Architect that all materials and equipment furnished under the Contract will be of good quality and new, except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise, and that none of the Work will be Defective Work as defined in Article 1.

#### **B. ONE-YEAR WARRANTY**

(1) If, within one year after the date of Substantial Completion of the Work or each designated portion of the Work (or otherwise as agreed upon in a mutually-executed Certificate of Substantial Completion), any of the Work is found to be Defective Work, the Contractor shall promptly upon receipt of written notice from the Owner or Architect, and without expense to either, replace or correct the Defective Work to conform to the requirements of the Contract Documents, and repair

all damage to the site, the building and its contents which is the result of Defective Work or its replacement or correction.

(2) The one-year warranty for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The one-year warranty for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion, and other Work performed after Substantial Completion, shall begin on the date of Final Acceptance of the Work. The Contractor's correction of Work pursuant to this warranty does not extend the period of the warranty. The Contractor's one-year warranty does not apply to defects or damages due to improper or insufficient maintenance, improper operation, or wear and tear during normal usage.

(3) Upon recognizing a condition of Defective Work, the Owner shall promptly notify the Contractor of the condition. If the condition is causing damage to the building, its contents, equipment, or site, the Owner shall take reasonable actions to mitigate the damage or its continuation, if practical. If the Contractor fails to proceed promptly to comply with the terms of the warranty, or to provide the Owner with satisfactory written verification that positive action is in process, the Owner may have the Defective Work replaced or corrected and the Contractor and the Contractor's Surety shall be liable for all expense incurred.

(4) **Year-end Inspection(s):** An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one-year warranty period(s). The inspection must be scheduled with the Owner, Architect and DCM Inspector. The subsequent delivery of the Architect's report of a Year-end Inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period.

(5) The Contractor's warranty of one year is in addition to, and not a limitation of, any other remedy stated herein or available to the Owner under applicable law.

### **C. GENERAL CONTRACTOR'S ROOFING GUARANTEE**

(1) In addition to any other roof related warranties or guarantees that may be specified in the Contract Documents, the roof and associated work shall be guaranteed by the General Contractor against leaks and defects of materials and workmanship for a period of five (5) years, starting on the Date of Substantial Completion of the Project as stated in the Certificate of Substantial Completion. This guarantee for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The guarantee for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion shall begin on the date of Final Acceptance of the Work.

(2) The "General Contractor's Roofing Guarantee" (DCM Form C-9), included in the Project Manual, shall be executed in triplicate, signed by the appropriate party and submitted to the Architect for submission with the Certificate of Substantial Completion to the Owner and the Division of Construction Management.

(3) This guarantee does not include costs which might be incurred by the General Contractor in making visits to the site requested by the Owner regarding roof problems that are due to lack of proper maintenance (keeping roof drains and/or gutters clear of debris that cause a stoppage of drainage which results in water ponding, overflowing of flashing, etc.), or damages caused by vandalism or misuse of roof areas. Should the contractor be required to return to the job to correct

problems of this nature that are determined not to be related to faulty workmanship and materials in the installation of the roof, payment for actions taken by the Contractor in response to such request will be the responsibility of the Owner. A detailed written report shall be made by the General Contractor on each of these 'Service Calls' with copies to the Architect, Owner and Division of Construction Management.

**D. SPECIAL WARRANTIES**

(1) The Contractor shall deliver to the Owner through the Architect all special or extended warranties required by the Contract Documents from the Contractor, Subcontractors, and suppliers.

(2) The Contractor and the Contractor's Surety shall be liable to the Owner for such special warranties during the Contractor's one-year warranty; thereafter, the Contractor's obligations relative to such special warranties shall be to provide reasonable assistance to the Owner in their enforcement.

**E. ASSUMPTION of GUARANTEES of OTHERS**

If the Contractor disturbs, alters, or damages any work guaranteed under a separate contract, thereby voiding the guarantee of that work, the Contractor shall restore the work to a condition satisfactory to the Owner and shall also guarantee it to the same extent that it was guaranteed under the separate contract.

**ARTICLE 36  
INDEMNIFICATION AGREEMENT**

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants (hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of, related to, or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including loss of use resulting therefrom, and is caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part, or is alleged but not legally established to have been caused in whole or in part by the negligence or other fault of a party indemnified hereunder.

**A.** This indemnification shall extend to all claims, damages, losses and expenses for injury or damage to adjacent or neighboring property, or persons injured thereon, that arise out of, relate to, or result from performance of the Work.

**B.** This indemnification does not extend to the liability of the Architect, or the Architect's Consultants, agents, or employees, arising out of (1) the preparation or approval of maps, shop drawings, opinions, reports, surveys, field orders, Change Orders, drawings or specifications, or (2) the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions is the primary cause of the injury or damage.

**C.** This indemnification does not apply to the extent of the sole negligence of the Indemnitees.

**ARTICLE 37**  
**CONTRACTOR'S and SUBCONTRACTORS' INSURANCE**

*(Provide entire Article 37 to Contractor's insurance representative.)*

**A. GENERAL**

**(1) RESPONSIBILITY.** The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

**(2) INSURANCE PROVIDERS.** Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

**(3) NOTIFICATION ENDORSEMENT.** Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

**(4) INSURANCE CERTIFICATES.** The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract. The insurance certificate must provide the following:

- (a) Name and address of authorized agent of the insurance company
- (b) Name and address of insured
- (c) Name of insurance company or companies
- (d) Description of policies
- (e) Policy Number(s)
- (f) Policy Period(s)
- (g) Limits of liability
- (h) Name and address of Owner as certificate holder
- (i) Project Name and Number, if any
- (j) Signature of authorized agent of the insurance company
- (k) Telephone number of authorized agent of the insurance company
- (l) Mandatory thirty day notice of cancellation / non-renewal / change

**(5) MAXIMUM DEDUCTIBLE.** Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed \$25,000.00.

**B. INSURANCE COVERAGES**

Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability limits not less than as follows:

**(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE**

**(a)** Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims.

**(b)** Employer's Liability Insurance limits shall be at least:

- .1 Bodily Injury by Accident - \$1,000,000 each accident
- .2 Bodily Injury by Disease - \$1,000,000 each employee

**(2) COMMERCIAL GENERAL LIABILITY INSURANCE**

**(a)** Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

<u>Coverage</u>	<u>Limit</u>
.1 General Aggregate	\$ 2,000,000.00 per Project
.2 Products, Completed Operations Aggregate	\$ 2,000,000.00 per Project
.3 Personal and Advertising Injury	\$ 1,000,000.00 per Occurrence
.4 Each Occurrence	\$ 1,000,000.00

**(b)** Additional Requirements for Commercial General Liability Insurance:

- .1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.
- .2 The policy must include separate per project aggregate limits.

**(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE**

**(a)** Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than \$1,000,000 Combined Single Limits for each occurrence.

**(b)** The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.



- (4) **COMMERCIAL UMBRELLA OR COMMERCIAL EXCESS LIABILITY INSURANCE**
- (a) Commercial Umbrella or Commercial Excess Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.
- (b) Minimum Combined Primary Commercial General Liability and Commercial Umbrella or Commercial Excess Limits of:
- .1 \$ 5,000,000 per Occurrence
  - .2 \$ 5,000,000 Aggregate
- (c) Additional Requirements for Commercial Umbrella or Commercial Excess Liability Insurance:
- .1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.
  - .2 The policy must be on an "occurrence" basis.
- (5) **BUILDER'S RISK INSURANCE**

- (a) The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss - Special Form (current edition as of the date of Advertisement for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.
- (b) The policy shall be endorsed as follows:

"The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

- (i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or
- (ii) Partial or complete occupancy by Owner; or
- (iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

Exception: projects containing only abatement and/or only demolition do not require Builder's Risk insurance, unless required by the Owner. Note: projects containing any scope of work besides abatement and/or demolition require Builder's Risk insurance.

## C. **SUBCONTRACTORS' INSURANCE**

- (1) **WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE.** The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph B, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.
- (2) **LIABILITY INSURANCE.** The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella or Excess Liability Insurance coverages similar to those described in preceding Paragraph B. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.
- (3) **ENFORCEMENT RESPONSIBILITY.** The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of insurance for any Subcontractor.

**D. TERMINATION of OBLIGATION to INSURE**

Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

**(1) BUILDER'S RISK INSURANCE.** The obligation to insure under Subparagraph B(5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

**(2) PRODUCTS and COMPLETED OPERATIONS.** The obligation to carry Products and Completed Operations coverage specified under Subparagraph B(2) shall remain in effect for two years after the Date(s) of Substantial Completion.

**(3) ALL OTHER INSURANCE.** The obligation to carry other insurance coverages specified under Subparagraphs B(1) through B(4) and Paragraph C shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

**E. WAIVERS of SUBROGATION**

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work.

**ARTICLE 38**  
**PERFORMANCE and PAYMENT BONDS**

**A. GENERAL**

Upon signing and returning the Construction Contract to the Owner for final approval and execution, the Contractor shall, at the Contractor's expense, furnish to the Owner a Performance Bond and a Payment Bond (P&P Bonds), DCM Forms C-6 and C-7 as contained in the Project Manual, each in a penal sum equal to 100% of the Contract Sum. Each bond shall be on the form contained in the Project Manual, shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount. The P&P bonds must be signed either on the same day or after the construction contract date. Each P&P Bond shall have attached thereto a power of attorney (POA) of the signing official. The POA signature date must be the same day as the P&P Bond's signature date. All signatures must be present.

The provisions of this Article are not applicable to this Contract if the Contract Sum is less than \$100,000, unless bonds are required for this Contract in the Supplemental General Conditions.

**B. PERFORMANCE BOND**

Through the Performance Bond, the Surety's obligation to the Owner shall be to assure the prompt and faithful performance of the Contract and Contract Change Orders. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. In case of default on the part of the Contractor, the Surety shall take charge of and complete the Work in accordance with the terms of the Performance Bond. Any reasonable expenses incurred by the Owner as a result of default on the part of the Contractor, including architectural, engineering, administrative, and legal services, shall be recoverable under the Performance Bond.

**C. PAYMENT BOND**

Through the Payment Bond the Surety's obligation to the Owner shall be to guarantee that the Contractor and its Subcontractors shall promptly make payment to all persons supplying labor, materials, or supplies for, or in, the prosecution of the Work, including the payment of reasonable attorneys fees incurred by successful claimants or plaintiffs in civil actions on the Bond. Any person or entity indicating that they have a claim of nonpayment under the Bond shall, upon written request, be promptly furnished a certified copy of the Bond and Construction Contract by the Contractor, Architect, Owner, or Alabama Division of Construction Management, whomever is recipient of the request.

**D. CHANGE ORDERS**

The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

**E. EXPIRATION**

The obligations of the Contractor's performance bond surety shall be coextensive with the contractor's performance obligations under the Contract Documents; provided, however, that the

surety's obligation shall expire at the end of the one-year warranty period(s) of Article 35.

**ARTICLE 39**  
**ASSIGNMENT**

The Contractor shall not assign the Contract or sublet it as a whole nor assign any moneys due or to become due to the Contractor thereunder without the previous written consent of the Owner (and of the Surety, in the case of a bonded Construction Contract). As prescribed by the Public Works Law, the Contract shall in no event be assigned to an unsuccessful bidder for the Contract whose bid was rejected because the bidder was not a responsible or responsive bidder.

**ARTICLE 40**  
**CONSTRUCTION by OWNER or SEPARATE CONTRACTORS**

**A. OWNER'S RESERVATION of RIGHT**

(1) The Owner reserves the right to self-perform, or to award separate contracts for, other portions of the Project and other Project related construction and operations on the site. The contractual conditions of such separate contracts shall be substantially similar to those of this Contract, including insurance requirements and the provisions of this Article. If the Contractor considers such actions to involve delay or additional cost under this Contract, notifications and assertion of claims shall be as provided in Article 20 and Article 23.

(2) When separate contracts are awarded, the term "Contractor" in the separate Contract Documents shall mean the Contractor who executes the respective Construction Contract.

**B. COORDINATION**

Unless otherwise provided in the Contract Documents, the Owner shall be responsible for coordinating the activities of the Owner's forces and separate contractors with the Work of the Contractor. The Contractor shall cooperate with the Owner and separate contractors, shall participate in reviewing and comparing their construction schedules relative to that of the Contractor when directed to do so, and shall make and adhere to any revisions to the construction schedule resulting from a joint review and mutual agreement.

**C. CONDITIONS APPLICABLE to WORK PERFORMED by OWNER**

Unless otherwise provided in the Contract Documents, when the Owner self-performs construction or operations related to the Project, the Owner shall be subject to the same obligations to Contractor as Contractor would have to a separate contractor under the provision of this Article 40.

**D. MUTUAL RESPONSIBILITY**

(1) The Contractor shall reasonably accommodate the required introduction and storage of materials and equipment and performance of activities by the Owner and separate contractors and shall connect and coordinate the Contractor's Work with theirs as required by the Contract Documents.

(2) By proceeding with an element or portion of the Work that is applied to or performed on construction by the Owner or a separate contractor, or which relies upon their operations, the Contractor accepts the condition of such construction or operations as being suitable for the Contractor's Work, except for conditions that are not reasonably discoverable by the Contractor. If the Contractor discovers any condition in such construction or operations that is not suitable for the proper performance of the Work, the Contractor shall not proceed, but shall instead promptly notify the Architect in writing of the condition discovered.

(3) The Contractor shall reimburse the Owner for any costs incurred by a separate contractor and payable by the Owner because of acts or omissions of the Contractor. Likewise, the Owner shall be responsible to the Contractor for any costs incurred by the Contractor because of the acts or omissions of a separate contractor.

(4) The Contractor shall not cut or otherwise alter construction by the Owner or a separate contractor without the written consent of the Owner and separate contractor; such consent shall not be unreasonably withheld. Likewise, the Contractor shall not unreasonably withhold its consent allowing the Owner or a separate contractor to cut or otherwise alter the Work.

(5) The Contractor shall promptly remedy any damage caused by the Contractor to the construction or property of the Owner or separate contractors.

#### **ARTICLE 41** **SUBCONTRACTS**

##### **A. AWARD of SUBCONTRACTS and OTHER CONTRACTS for PORTIONS of the WORK**

(1) Unless otherwise provided in the Contract Documents, when delivering the executed Construction Contract, bonds, and evidence of insurance to the Architect, the Contractor shall also submit a listing of Subcontractors proposed for each principal portion of the Work and fabricators or suppliers proposed for furnishing materials or equipment fabricated to the design of the Contract Documents. This listing shall be in addition to any naming of Subcontractors, fabricators, or suppliers that may have been required in the bid process. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any Subcontractor, fabricator, or supplier proposed by the Contractor. The issuance of the Notice to Proceed in the absence of such objection by the Owner shall constitute notice that no reasonable objection to them is made.

(2) The Contractor shall not contract with a proposed Subcontractor, fabricator, or supplier to whom the Owner has made reasonable and timely objection. Except in accordance with prequalification procedures as may be contained in the Contract Documents, through specified qualifications, or on the grounds of reasonable objection, the Owner may not restrict the Contractor's selection of Subcontractors, fabricators, or suppliers.

(3) Upon the Owner's reasonable objection to a proposed Subcontractor, fabricator, or supplier, the Contractor shall promptly propose another to whom the Owner has no reasonable objection. If the proposed Subcontractor, fabricator, or supplier to whom the Owner made reasonable objection was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be equitably adjusted by Contract Change Order for any resulting difference if the Contractor has acted promptly and responsively in this procedure.

(4) The Contractor shall not change previously selected Subcontractors, fabricators, or suppliers without notifying the Architect and Owner in writing of proposed substitute Subcontractors, fabricators, or suppliers. If the Owner does not make a reasonable objection to a proposed substitute within three working days, the substitute shall be deemed approved.

**B. SUBCONTRACTUAL RELATIONS**

(1) The Contractor agrees to bind every Subcontractor and material supplier (and require every Subcontractor to so bind its subcontractors and material suppliers) to all the provisions of the Contract Documents as they apply to the Subcontractor's and material supplier's portion of the Work.

(2) Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner, nor to create a duty of the Architect, Owner, or Director to resolve disputes between or among the Contractor or its Subcontractors and suppliers or any other duty to such Subcontractors or suppliers.

**ARTICLE 42**  
**ARCHITECT'S STATUS**

A. The Architect is an independent contractor performing, with respect to this Contract, pursuant to an agreement executed between the Owner and the Architect. The Architect has prepared the Drawings and Specifications and assembled the Contract Document and is, therefore, charged with their interpretation and clarification as described in the Contract Documents. As a representative of the Owner, the Architect will endeavor to guard the Owner against variances from the requirements of the Contract Documents by the Contractor. On behalf of the Owner, the Architect will administer the Contract as described in the Contract Documents during construction and the Contractor's one-year warranty.

B. So as to maintain continuity in administration of the Contract and performance of the Work, and to facilitate complete documentation of the project record, all communications between the Contractor and Owner regarding matters of or related to the Contract shall be directed through the Architect, unless direct communication is otherwise required to provide a legal notification. Unless otherwise authorized by the Architect, communications by and with the Architect's consultants shall be through the Architect. Unless otherwise authorized by the Contractor, communications by and with Subcontractors and material suppliers shall be through the Contractor.

**C. ARCHITECT'S AUTHORITY**

Subject to other provisions of the Contract Documents, the following summarizes some of the authority vested in the Architect by the Owner with respect to the Construction Contract and as further described or conditioned in other Articles of these General Conditions of the Contract.

**(1) The Architect is authorized to:**

- (a) approve "minor" deviations as defined in Article 9, Submittals,
- (b) make "minor" changes in the Work as defined in Article 19, Changes in the Work,
- (c) reject or require the correction of Defective Work,
- (d) require the Contractor to stop the performance of Defective Work,
- (e) adjust an Application for Payment by the Contractor pursuant to Article 30, Certification

and Approval of payments, and  
(f) issue Notices to Cure pursuant to Article 27.

**(2) The Architect is not authorized to:**

- (a) revoke, alter, relax, or waive any requirements of the Contract Documents (other than “minor” deviations and changes) without concurrence of the Owner,
- (b) finally approve or accept any portion of the Work without concurrence of the Owner,
- (c) issue instructions contrary to the Contract Documents,
- (d) issue Notice of Termination or otherwise terminate the Contract, or
- (e) require the Contractor to stop the Work except only to avoid the performance of Defective Work.

**D. LIMITATIONS of RESPONSIBILITIES**

(1) The Architect shall not be responsible to Contractors or to others for supervising or coordinating the performance of the Work or for the Construction Methods or safety of the Work, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Architect will not be responsible to the Contractor (nor the Owner) for the Contractor’s failure to perform the Work in accordance with the requirements of the Contract Documents or for acts or omissions of the Contractor, a Subcontractor, or anyone for whose acts they may be liable. However, the Architect will report to the Owner and Contractor any Defective Work recognized by the Architect.

(3) The Architect will endeavor to secure faithful performance by Owner and Contractor, and the Architect will not show partiality to either or be liable to either for results of interpretations or decisions rendered in good faith.

(4) The Contractor’s remedies for additional time or expense arising out of or related to this Contract, or the breach thereof, shall be solely as provided for in the Contract Documents. The Contractor shall have no claim or cause of action against the Owner, Architect, or its consultants for any actions or failures to act, whether such claim may be in contract, tort, strict liability, or otherwise, it being the agreement of the parties that the Contractor shall make no claim against the Owner or any agents of the Owner, including the Architect or its consultants, except as may be provided for claims or disputes submitted in accordance with Article 24. The Architect and Architect’s consultants shall be considered third party beneficiaries of this provision of the Contract and entitled to enforce same.

**E. ARCHITECT’S DECISIONS**

Decisions by the Architect shall be in writing. The Architect’s decisions on matters relating to aesthetic effect will be final and binding if consistent with the intent expressed in the Contract Documents. The Architect’s decisions regarding disputes arising between the Contractor and Owner shall be advisory.

**ARTICLE 43**  
**CASH ALLOWANCES**

A. All allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner

and the Contractor shall afford the Owner the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.

- B.** Unless otherwise provided in the Contract Documents:
- (1) allowances shall cover the cost to the Contractor of materials and equipment delivered to the Project site and all applicable taxes, less applicable trade discounts;
  - (2) the Contractor's costs for unloading, storing, protecting, and handling at the site, labor, installation, overhead, profit and other expenses related to materials or equipment covered by an allowance shall be included in the Contract Sum but not in the allowances;
  - (3) if required, the Contract Sum shall be adjusted by Change Order to reflect the actual costs of an allowance.
- C.** Any selections of materials or equipment required of the Architect or Owner under an allowance shall be made in sufficient time to avoid delay of the Work.

**ARTICLE 44**  
**PERMITS, LAWS, and REGULATIONS**

**A. PERMITS, FEES AND NOTICES**

- (1) Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after award of the Construction Contract and which are in effect on the date of receipt of bids.
- (2) The Contractor shall comply with and give notices required by all laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

**B. TAXES**

Unless stated otherwise in the Contract Documents, materials incorporated into the Work are exempt from sales and use tax pursuant to Section 40-9-33, Code of Alabama, 1975 as amended. The Owner, Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, & Business Tax Division of the Alabama Department of Revenue regarding certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors. The Contractor shall pay all applicable taxes that are not covered by the exemption of Section 40-9-33 and which are imposed as of the date of receipt of bids, including those imposed as of the date of receipt of bids but scheduled to go into effect after that date.

**C. COMPENSATION for INCREASES**

The Contractor shall be compensated for additional costs incurred because of increases in tax rates imposed after the date of receipt of bids.

**D. ALABAMA IMMIGRATION LAW**



Per ACT 2011-535 as codified in Title 31, Chapter 13 of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.

**E. ALABAMA TRADE BOYCOTT LAW**

Per Act 2016-312 as codified in Title 41, Chapter 16, Article 1, of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

**EE. ALABAMA ECONOMIC BOYCOTT LAW**

Per Act 2023-409 as codified in Title 41, Chapter 16, Article 1 of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, economic boycotts.

**F. ACCOUNTING OF SALES TAX EXEMPT PROJECTS**

Per Act 2013-205 as codified in Title 40, Chapter 9, Article 1, of the Code of Alabama, 1975, as amended:

In bidding the work on a tax exempt project, the bid form shall provide an accounting for the tax savings.

**ARTICLE 45**  
**ROYALTIES, PATENTS, and COPYRIGHTS**

The Contractor shall pay all royalties and license fees. The Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of, related to, or resulting from all suits or claims for infringement of any patent rights or copyrights arising out of the inclusion of any patented or copyrighted materials, methods, or systems selected by the Contractor and used during the execution of or incorporated into the Work. This indemnification does not apply to any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods, or systems specified in the Contract Documents. However, if the Contractor has information that a specified material, method, or system is or may constitute an infringement of a patent or copyright, the Contractor shall be responsible for any resulting loss unless

such information is promptly furnished to the Architect.

**ARTICLE 46**  
**USE of the SITE**

- A. The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials, equipment, employees' vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.
- B. Unless otherwise provided in the Contract Documents, temporary facilities, such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner. Such temporary buildings and/or utilities shall remain the property of the Contractor, and be removed at the Contractor's expense upon completion of the Work, unless the Owner authorizes their abandonment without removal.

**ARTICLE 47**  
**CUTTING and PATCHING**

- A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to execute the Work to the results indicated in the Contract Documents or to make its parts fit together properly.
- B. Any cutting, patching, or excavation by the Contractor shall be supervised and performed in a manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of the Owner or separate contractors.

**ARTICLE 48**  
**IN-PROGRESS and FINAL CLEANUP**

**A. IN-PROGRESS CLEAN-UP**

(1) The Contractor shall at all times during the progress of the Work keep the premises and surrounding area free from rubbish, scrap materials and debris resulting from the Work. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings. Burning of trash and debris on site is not permitted.

(2) The Contractor shall make provisions to minimize and confine dust and debris resulting from construction activities.

**B. FINAL CLEAN-UP**

(1) Before Substantial Completion or Final Acceptance is achieved, the Contractor shall have

removed from the Owner's property all construction equipment, tools, and machinery; temporary structures and/or utilities including the foundations thereof (except such as the Owner permits in writing to remain); rubbish, debris, and waste materials; and all surplus materials, leaving the site clean and true to line and grade, and the Work in a safe and clean condition, ready for use and operation.

(2) In addition to the above, and unless otherwise provided in the Contract Documents, the Contractor shall be responsible for the following special cleaning for all trades as the Work is completed:

(a) **Cleaning of all painted, enameled, stained, or baked enamel work:** Removal of all marks, stains, finger prints and splatters from such surfaces.

(b) **Cleaning of all glass:** Cleaning and removing of all stickers, labels, stains, and paint from all glass, and the washing and polishing of same on interior and exterior.

(c) **Cleaning or polishing of all hardware:** Cleaning and polishing of all hardware.

(d) **Cleaning all tile, floor finish of all kinds:** Removal of all splatters, stains, paint, dirt, and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Architect.

(e) **Cleaning of all manufactured articles, materials, fixtures, appliances, and equipment:** Removal of all stickers, rust stains, labels, and temporary covers, and cleaning and conditioning of all manufactured articles, material, fixtures, appliances, and electrical, heating, and air conditioning equipment as recommended or directed by the manufacturers, unless otherwise required by the Architect; blowing out or flushing out of all foreign matter from all equipment, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers, sanitizing potable water systems; and freeing identification plates on all equipment of excess paint and the polishing thereof.

### **C. OWNER'S RIGHT to CLEAN-UP**

If the Contractor fails to comply with these clean-up requirements and then fails to comply with a written directive by the Architect to clean-up the premises within a specified time, the Architect or Owner may implement appropriate clean-up measures and the cost thereof shall be deducted from any amounts due or to become due the Contractor.

## **ARTICLE 49** **LIQUIDATED DAMAGES**

- A.** Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including but not limited to interest and additional administrative, architectural, inspection and supervision charges. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.
- B.** The Contract Documents may provide in the Construction Contract or elsewhere for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree that such amount is reasonable and agree to be bound thereby.

- C. If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.
- D. The amount of liquidated damages due under either paragraph B or C, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

#### **ARTICLE 50** **USE of FOREIGN MATERIALS**

- A. In the performance of the Work the Contractor agrees to use materials, supplies, and products manufactured, mined, processed or otherwise produced in the United States or its territories, if same are available at reasonable and competitive prices and are not contrary to any sole source specification implemented under the Public Works Law.
- B. In the performance of the Work the Contractor agrees to use iron or steel, that are made a permanent part of the structure, produced in the United States if the Contract Documents require the use of iron or steel and do not limit its supply to a sole source pursuant to the Public Works Law. If the Owner decides that the procurement of domestic steel products becomes impractical as a result of national emergency, national strike, or other cause, the Owner shall waive this restriction.
- C. If domestic steel or other domestic materials, supplies, and products are not used in accordance with preceding Paragraphs A and B, the Contract Sum shall be reduced by an amount equal to any savings or benefits realized by the Contractor.
- D. This Article applies only to Public Works projects financed entirely by the State of Alabama or any political subdivision of the state.

#### **ARTICLE 51** **PROJECT SIGN**

- A. Fully locally-funded State Agency and Public Higher Education projects: DCM Form C-15: Detail of Project Sign must be included in the project manual regardless of expected bid amount. If the awarded contract sum is \$100,000.00 or more, Contractor shall furnish and erect a project sign. Other conditions besides the contract sum may warrant waiver of this requirement, but only with approval of the Technical Staff.
- B. Fully locally-funded K-12 school projects: Project sign is not required unless requested by Owner; if project sign is requested by Owner, include DCM Form C-15: Detail of Project Sign in the project manual.
- C. Partially or fully PSCA-funded projects: DCM Form C-15: Detail of Project Sign must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of the contract sum. "Alabama Public School and College Authority" as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects.

When required per the above conditions, the project sign shall be erected in a prominent location selected by the Architect and Owner and shall be maintained in good condition until completion of Work. If the Contract involves Work on multiple sites, only one project sign is required, which shall be erected on one of the sites in a location selected by the Architect and Owner. Slogan: The title of the current PSCA Act should be placed on the project sign of all PSCA-funded projects, otherwise the Awarding Authority/Owner's slogan, if any, should be used. If the Awarding Authority/Owner of a fully locally-funded project does not have a slogan, the project sign does not require a slogan.

END of  
GENERAL CONDITIONS of the CONTRACT

# GENERAL CONTRACTOR'S ROOFING GUARANTEE

DCM Project No. \_\_\_\_\_

Project Name & Address	Project Owner Entity(ies) Name(s) & Address(es)
------------------------	---

General Contractor's Company Name, Address, & Telephone Number	<b>EFFECTIVE DATES OF GUARANTEE</b>
	Date of Acceptance:
	Date of Expiration:

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturers recommendations.
2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.
3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

- A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.
- B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.
- C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.
- D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
- E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF, this instrument has been duly executed this \_\_\_\_\_ day  
of \_\_\_\_\_, \_\_\_\_\_.

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General Contractor's Authorized Signature

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Typed Name and Title

DCM (BC) No. \_\_\_\_\_

PSCA Projects: PSCA No. \_\_\_\_\_

Application No. \_\_\_\_\_

Date: \_\_\_\_\_

# APPLICATION and CERTIFICATE for PAYMENT

Attach DCM Form C-IOSOV: Schedule of Values

<p><b>TO OWNER:</b> Entity Name: _____ Address: _____</p>	<p><b>PROJECT:</b> _____</p>
<p><b>FROM CONTRACTOR:</b> Company Name &amp; Address, which must exactly match co. name &amp; payment address spelling as registered in State of AL Accounting &amp; Resource System (STAARS) or AL Buys to avoid rejection:  STAARS or AL Buys Vendor #:</p>	<p><b>ARCHITECT / ENGINEER:</b> Firm Name: _____ Address: _____</p>

<b>A. Total Original Contract</b>	\$	
<b>B. Fully Executed (fully signed) Change Order(s) Numbers through _</b>	+\$	_____
<b>C. Total Contract To Date</b>	\$	_____
<hr/>		
<b>1. Work Completed to Date per attached Schedule of Values</b> <small>(Form C-IOSOV's Column F Total)</small>	\$	_____
<b>2. Materials Presently Stored</b> <small>(When this amount is greater than \$0.00, attach Form C-IOISM: Inventory of Stored Materials, or similar list)</small>	+\$	_____
<b>3. Total Work Completed to Date &amp; Materials Presently Stored</b> <small>(_____ % of Contract To Date)</small>	\$	_____
<b>4. Less Retainage</b> <small>(If Total Work Completed to Date &amp; Materials Presently Stored (#3) is less than or equal to 50% of Total Contract to Date (C), Retainage = #3 x 0.05. Once #3 exceeds 50% of C and up until project is complete, Retainage = C x 0.025. \$0 is retained on final payment application, see last bullet point below Instructions.)</small>	-\$	_____
<b>5. Total Due</b>	\$	_____
<b>6. Less Total Previous Payments Billed</b> <small>(Must exactly match #5 Total Due from previous payment application. #6 is \$0.00 if there is no previous payment application)</small>	-\$	_____
<b>7. Balance Due This Estimate</b>	\$	_____

Final pay app?  Yes.

**CONTRACTOR'S CERTIFICATION**

The undersigned Contractor certifies that to the best of his knowledge, information, and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payments were issued and payments received from the Owner and that current payment shown herein has not yet been received.

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Contractor's Signature

Name & Title \_\_\_\_\_

Sworn and subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_  
Seal: \_\_\_\_\_ Day \_\_\_\_\_ Month, Year

\_\_\_\_\_  
Notary Public's Signature

**ARCHITECT'S / ENGINEER'S CERTIFICATION**

In accordance with the Contract Documents, the Architect/ Engineer certifies to the Owner that, to the best of the Architect's/ Engineer's knowledge and belief, the Work has progressed to the point indicated herein, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the amount approved.

By \_\_\_\_\_  
Architect's / Engineer's Signature

Name & Title \_\_\_\_\_

Date \_\_\_\_\_

**INSTRUCTIONS**

- PSCA-funded projects, and State Agency-owned projects: Two copies of pay. app., each with original signatures and all attachments required.
- Date of first payment application cannot precede the Notice to Proceed's Begin Date.
- Pay. app. must exactly match an attached DCM Form C-10SOV: Schedule of Values.
- A change order must be fully executed before inclusion on a payment application.
- Contractor's signature date cannot precede the payment application date.
- Contractor and Notary signee dates must match.
- Progress schedules must be included with non-final payment applications.
- One payment application per month may be submitted.
- On a final payment application, the following is required for release of retainage: all change orders must be fully executed (signed by all parties and approval authorities) and included in B., the Certificate of Substantial Completion for entire work is fully executed, and all other close-out requirements per General Conditions Article 34 are completed.

**APPROVAL**

\_\_\_\_\_  
Owner Entity

By \_\_\_\_\_  
Signature

Name & Title \_\_\_\_\_

Date \_\_\_\_\_



# INVENTORY OF STORED MATERIALS

Project:	DCM (BC) No.:
	PSCA No, if any:
Contractor Company:	For Estimate No.:
	For Period Ending:

A Description	B Materials Stored Last Period	C Materials Purchased This Period (period noted above)	D Materials Used This Period (period noted above)	E Materials Presently Stored (B + C - D)
<b>TOTALS:</b>				

**Instructions :**

- This Form C-10SM must be submitted as part of the payment application documentation when a Materials Presently Stored amount of anything greater than \$0 is noted on line 2 of DCM Form C-10: Application and Certificate for Payment.
- Receipts must be provided as attachments to this form C-10SM for all amounts placed in Column C: Materials Purchased This Period.
- The total \$ amount of this Form C-10SM's column E: Materials Presently Stored must match both Form C-10's line 2: Materials Presently Stored, and Form C-10SOV: Schedule of Values' total \$ amount of Column G: Materials Presently Stored.
- The \$ amounts in this current Form C-10SM's Column D: Materials Used This Period are amounts that must all be included in the current payment application's Form C-10SOV's Column E: Work Completed This Period.
- The \$ amounts in this current Form C-10SM's Column E: Materials Presently Stored are the amounts that must be listed in the next payment application's Form C-10SM's Column B: Materials Stored Last Period.

# SCHEDULE OF VALUES (SOV)

DCM Form C-10SOV  
Revised October 2021

Project:	DCM (BC) Project Number:			
	PSCA Project Number, if any:			
Contractor Company:	Application Number:			
	Application Date:			
	Period From:		Period To:	

A	B	C	D	E	F	G	H	I	J
Item No.	Description of Work	Scheduled Value (including fully executed [signed by all parties] change order amounts)	Work Completed		Total Work Completed to Date (This application SOV's D + E)	Materials Presently Stored (G total greater than \$0 must match C-10SM's column E total. This SOV's G amounts are not in this SOV's D nor E amounts.)	Total Work Completed to Date & Materials Presently Stored (This SOV's F + G)	Percent of Contract Completed to Date (This SOV's H / C)	Retainage (This column's Total's cell formula calculates the applicable variable rate)
			Work Previously Completed (Previous pay app SOV's column F. D is \$0 if this SOV is for first pay app.)	Work Completed This Period (Period as noted above)					
1.					\$ -		\$ -		Retainage Variable Rate:  If Total Work Completed to Date & Materials Presently Stored (H) is less than or equal to 50% of Total Scheduled Value (C), Retainage = H x 0.05.  Once H exceeds 50% of C and up until project is complete, Retainage = C x 0.025.  There will be no retainage on final payment application.
2.					\$ -		\$ -		
3.					\$ -		\$ -		
4.					\$ -		\$ -		
5.					\$ -		\$ -		
6.					\$ -		\$ -		
7.					\$ -		\$ -		
8.					\$ -		\$ -		
9.					\$ -		\$ -		
10.					\$ -		\$ -		
11.					\$ -		\$ -		
12.					\$ -		\$ -		
13.					\$ -		\$ -		
14.					\$ -		\$ -		
15.					\$ -		\$ -		
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19.					\$ -		\$ -		
20.					\$ -		\$ -		
21.					\$ -		\$ -		
22.					\$ -		\$ -		
23.					\$ -		\$ -		
24.					\$ -		\$ -		
25.					\$ -		\$ -		
<b>TOTALS:</b>		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		\$ -

This pay app SOV's column totals must match amounts in this pay app Form C-10 per the following indicated Form C-10 line #s:	C.	None	None	1.	2.	3.	3.	4.
--	----	------	------	----	----	----	----	----

Note: If this SOV's column G: Materials Presently Stored includes any amounts other than \$0, then DCM Form C-10SM: Inventory of Stored Materials with back-up receipts must be submitted as part of the payment application documentation.

<b>SAMPLE PROGRESS SCHEDULE &amp; REPORT</b>			CONTRACTOR (Contractor may use own form in lieu of Form C-11):				DATE OF REPORT:			
DCM (BC) No.:							ARCHITECT/ENGINEER:			
PSCA projects: PSCA No.:			PROJECTED COMPLETION DATE:							
PROJECT:										

WORK DIVISION	%	AMOUNT														
1. GENERAL REQUIREMENTS																
2. SITEWORK																
3. CONCRETE																
4. MASONRY																
5. METALS																
6. WOOD AND PLASTIC																100%
7. THERMAL AND MOISTURE PROTECTION																90%
8. DOORS AND WINDOWS																80%
9. FINISHES																70%
10. SPECIALTIES																60%
11. EQUIPMENT																50%
12. FURNISHINGS																40%
13. SPECIAL CONSTRUCTION																30%
14. CONVEYING SYSTEMS																20%
15. MECHANICAL																10%
16. ELECTRICAL																0%
TOTAL ORIG. CONTRACT	100%															
ANTICIPATED DRAW IN \$1,000																
ACTUAL DRAW IN \$1,000																

												DCM Form C-11 August 2021
USE ADDITIONAL SHEETS IF JOB IS SCHEDULED OVER 12 MONTHS.												

*This form is provided solely for the purpose of inclusion in the project manual. A Construction Contract for fully locally-funded K-12 projects must be initiated via the appropriate DocuSign link from DCM's Engage Portal at <https://engagealabamarpm.facilityforce.cloud> by the Lead Design Professional Firm.*

DCM Form C-12 (fully locally-funded K-12 school project)  
revised October 2024

*A Change Order is not valid without an accompanying completed Change Order Justification (DCM Form B-11).*

## CONTRACT CHANGE ORDER

Change Order No. \_\_\_\_\_ Date \_\_\_\_\_ DCM (BC) No. \_\_\_\_\_

<b>TO: (Contractor)</b> Co. Name: Address:	<b>PROJECT:</b>
--	-----------------

TERMS: You are hereby authorized, subject to the provisions of your Contract for this project, to make the following changes thereto in accordance with your proposal(s) dated \_\_\_\_\_

\_\_\_\_\_.

FURNISH the necessary labor, materials, and equipment to *(Description of work to be done or changes to be made. If the description is continued in an attachment, identify the attachment below; only use an attachment if fields below become full.)*:

Description continued from Page 1:

<b>ORIGINAL CONTRACT SUM</b>		\$ _____
<b>NET TOTAL OF PREVIOUS CHANGE ORDERS</b>		\$ _____
<b>PREVIOUS REVISED CONTRACT SUM</b>		\$ _____
<b>THIS CHANGE ORDER WILL</b>	<b>INCREASE</b>	<b>DECREASE</b>
	<b>THE CONTRACT SUM BY</b>	
		\$ _____
<b>REVISED CONTRACT SUM, INCLUDING THIS CHANGE ORDER</b>		\$ _____

**EXTENSION OF TIME** resulting from this Change Order    None    or    \_\_\_\_\_ Calendar days.

The Owner does hereby certify that this Change Order was executed in accordance with the provisions of Title 39, Code of Alabama, 1975, as amended.

\_\_\_\_\_

Architectural/Engineering Firm

Recommended By \_\_\_\_\_

Name & Title \_\_\_\_\_

**APPROVAL**

**ALABAMA STATE DEPARTMENT OF EDUCATION**  
**(SDE)**  
*(Required for locally-funded, SDE projects.)*

By \_\_\_\_\_ Date: \_\_\_\_\_  
State Superintendent of Education

**CONTRACTING PARTIES**

\_\_\_\_\_

Contractor Company

By \_\_\_\_\_

Name & Title \_\_\_\_\_

\_\_\_\_\_

Awarding Authority/Owner Entity

By \_\_\_\_\_

Name & Title \_\_\_\_\_

**CONSENT OF SURETY** (for additive \$ change orders only)

\_\_\_\_\_

Surety Company

By \_\_\_\_\_

(Attach current Power of Attorney)

Name & Title \_\_\_\_\_

*Routing of the Construction Contract to reviewers and e-signers is automated through DocuSign. DocuSign links for fully locally-funded contract documents are available from DCM's Engage Portal at <https://engagealabama-rpm.facilityforce.cloud>*

# CERTIFICATE OF SUBSTANTIAL COMPLETION

**ROUTING PROCEDURES ON NEXT PAGE**

DCM (BC) No. \_\_\_\_\_

<b>OWNER ENTITY NAME AND ADDRESS:</b>  Email to receive executed copy: _____	<b>ARCHITECTURAL / ENGINEERING FIRM NAME AND ADDRESS:</b>  Email to receive executed copy: _____
<b>CONTRACTOR COMPANY NAME AND ADDRESS:</b>  Email to receive executed copy: _____	<b>BONDING COMPANY NAME AND ADDRESS:</b>  Email to receive executed copy: _____
<b>PROJECT:</b>  _____ _____	

**Substantial Completion** has been achieved for  the entire Work  the following portion of the Work:

\_\_\_\_\_

The **Date of Substantial Completion** of the Work covered by this certificate is established to be \_\_\_\_\_.

"Substantial Completion" means the designated Work is sufficiently complete, in accordance with the Contract Documents, such that the Owner may occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work. The Date of Substantial Completion is the date upon which all warranties for the designated Work commence, unless otherwise agreed and recorded herein.

**Punch List:** A \_\_\_\_\_ page list of items to be completed or corrected prior to the Owner's approval of Final Payment is attached hereto, but does not alter the Contractor's responsibility to complete or correct all Work in full compliance with the Contract Documents. The Contractor shall complete or correct all items on the attached list, ready for re-inspection for Final Acceptance, within 30 days after the above Date of Substantial Completion, unless another date is stated here: \_\_\_\_\_.

If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item.

**Only one (1) originally executed substantial completion form shall be routed for signature. DCM office will mail the fully-executed original to the Owner and email copies to all parties.**

<b>RECOMMENDED BY</b> ( <i>signature and email address required</i> ): ARCHITECT/ENGINEER: _____ <b>CONTRACTING PARTIES:</b> CONTRACTOR: _____ OWNER: _____ <b>APPROVALS:</b> DCM INSPECTOR: _____ DCM CHIEF INSPECTOR: _____ DCM DIRECTOR: _____	DATE: _____  DATE: _____ DATE: _____ DATE: _____  DATE: _____ DATE: _____ DATE: _____
---	---

# CERTIFICATE OF SUBSTANTIAL COMPLETION ROUTING PROCEDURE

**Only one (1) substantial completion form shall be routed for e-signatures, via DocuSign link from DCM's Engage Portal at: <https://engagealabama-rpm.facilityforce.cloud>**

## **NOTICE**

**THE EXECUTED “GENERAL CONTRACTOR’S ROOFING GUARANTEE” (DCM Form C-9) AND ANY OTHER ROOFING WARRANTY REQUIRED BY THE CONTRACT MUST ACCOMPANY THIS CERTIFICATE TO OBTAIN DCM APPROVAL.**

Also, any standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

## SAMPLE FORM OF ADVERTISEMENT FOR COMPLETION

### LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given

that \_\_\_\_\_,  
(Contractor Company Name)

Contractor, has completed the Contract for  (Construction)  (Renovation)  (Alteration)  
 (Equipment)  (Improvement) of \_\_\_\_\_  
(Name of Project):

at \_\_\_\_\_,  
(Insert location data in County or City)

for the State of Alabama and the (County) (City) of \_\_\_\_\_,  
Owner(s), and have made request for final settlement of said Contract. All persons having  
any claim for labor, materials, or otherwise in connection with this project should immediately  
notify

\_\_\_\_\_  
\_\_\_\_\_  
(Architect / Engineer)

\_\_\_\_\_  
(Contractor)

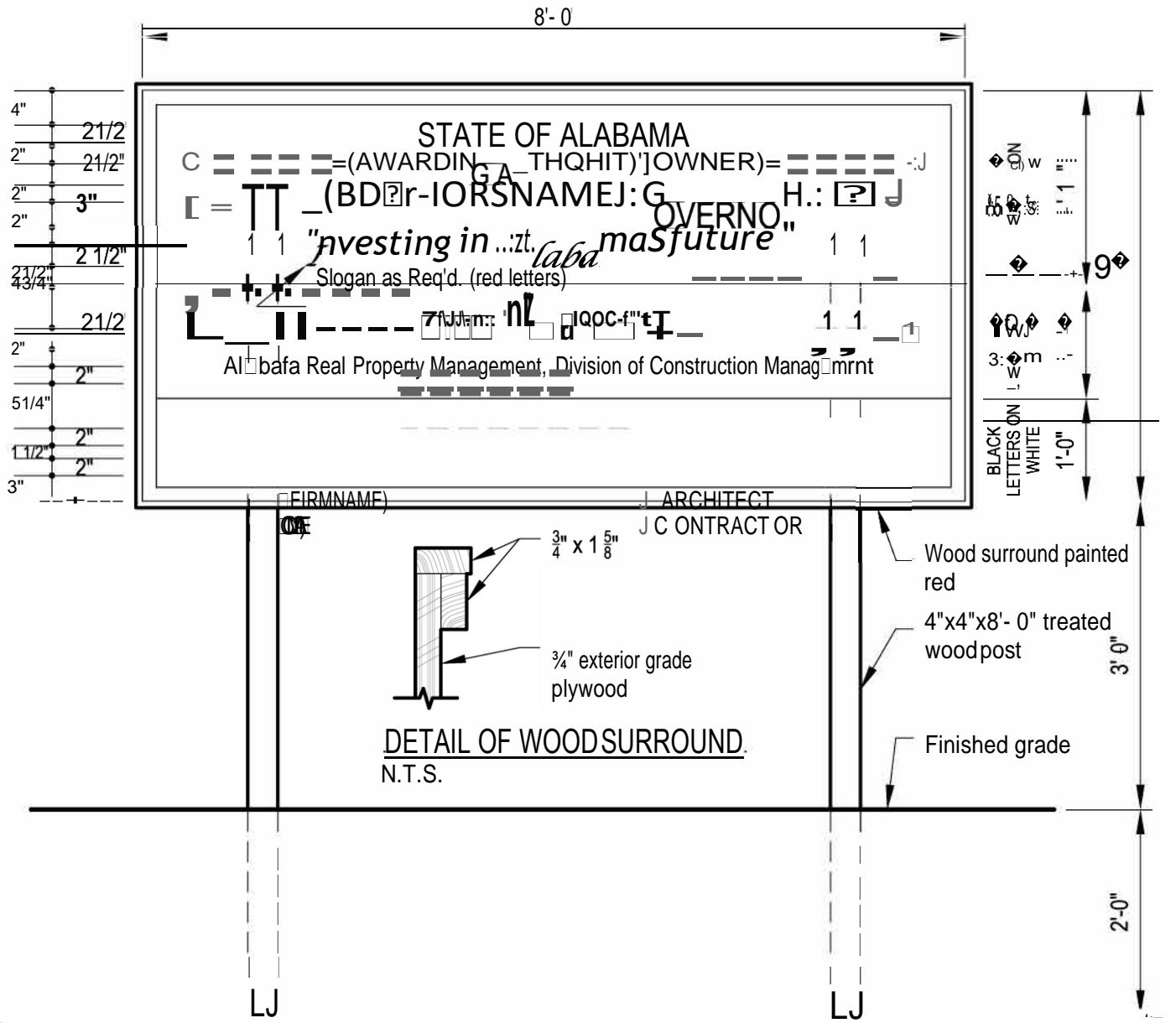
\_\_\_\_\_  
(Business Address)

NOTE: This notice must be run for a minimum of three weeks for projects of \$100,000.00 or more. For acceptable methods of advertisement, see General Conditions of the Contract, Article 34. Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher or website owner and a printed copy of the notice published. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice.



# DETAIL OF PROJECT SIGN

N.T.S.



**Notes:**

1. Fully locally-funded State Agency and Public University projects: DCM Form C-15 must be included in the project manual regardless of expected bid amount. If the awarded contract sum is \$100,000.00 or more, Contractor shall furnish and erect a project sign.  
Fully locally-funded K-12 school projects: Project sign is not required unless requested by Owner, if project sign is requested by Owner, include DCM Form C-15 in the project manual.  
Partially or fully PSCA-funded projects: DCM Form C-15 must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of contract sum. "Alabama Public School and College Authority" as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects. Exception: Alabama Community College System (ACCS) PSCA-funded projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.  
Fully locally-funded ACCS projects with Notice-To-Proceeds issued prior to August 1, 2021: DCM Form C-15 must be included in the project manual regardless of expected bid amount. If the awarded contract sum is \$100,000.00 or more, Contractor shall furnish and erect a project sign.
2. Sign to be constructed of 3/4" exterior grade plywood.
3. Paint with two coats best grade exterior paint before letters are painted. Option: In lieu of painted lettering on plywood, a corrugated plastic sign (displaying the same lettering, layout and colors as above) may be secured directly to the unpainted exterior grade plywood.
4. Sign shall be placed in a prominent location and easily readable from existing street or roadway.
5. Sign shall be maintained in good condition until project completion.
6. Slogan: Act 2020-167's title "Investing In Alabama's Future" should be placed on the project signs of all PSCA-funded projects, otherwise the Awarding Authority/Owner's slogan, if any, should be used. If the Awarding Authority/Owner of a fully locally-funded project does not have a slogan, the project sign does not require a slogan.

DCM No. \_\_\_\_\_

**CONTRACTOR'S STATEMENT OF RESPONSIBILITY FOR  
CONSTRUCTION OF TORNADO STORM SHELTER  
(HURRICANE SHELTER WHERE APPLICABLE)**

Project Name: \_\_\_\_\_

Owner Entity: \_\_\_\_\_

Architectural/Engineering Firm: \_\_\_\_\_

Contractor Company: \_\_\_\_\_

I \_\_\_\_\_, acknowledge that I am responsible to the Owner, the Alabama  
General Contractor  
Division of Construction Management, the Alabama Community College System or the State Department  
of Education as applicable, and the Architect/Engineer for the construction of the main wind-force  
resisting system and any other components listed in the **attached Quality Assurance Plan (QAP)**.

I acknowledge that I am aware of the special requirements contained in the QAP.

I certify that control will be exercised to obtain compliance with the construction documents. The  
procedures for exercising control shall be as listed below:

Control Procedure	How Reported	Distributed To	Distribution Frequency

(Attach additional pages if needed)

Furthermore, the following persons will be responsible for exercising control in accordance with the QAP.  
Any changes to the persons listed below will be coordinated with the Owner a minimum of 3 calendar  
days in advance of the change. The Owner shall provide written objections to the changes within 10  
calendar days. No response shall be deemed acceptance.

Name of Person	Responsibility for QAP

Signed on this date, \_\_\_\_\_, 20 \_\_\_\_.

\_\_\_\_\_  
Contractor Company

By: \_\_\_\_\_  
Signature of Contractor

Name and Title: \_\_\_\_\_

- Specifications:** This form must be included in the project manual submitted to DCM for Final Plan Review for:
- All new public K-12 (including Charter) schools, awarded after July 1, 2010, with tornado storm shelters as required by Act 2010-746.
  - All public K-12 (including Charter) additions and renovations which are required to contain tornado storm shelters by the International Building Code, Section 423.
  - All private K-12 new schools, additions and renovations as required by the International Building Code, Section 423.
  - All new buildings containing classrooms or dorm rooms on the grounds of all public 2-year or 4-year institutions of higher education, statewide, awarded on or after August 1, 2012, as required by Act 2012-554.
  - **State Agency/Authority projects when assigned to DCM.**

- Submittal of Executed Form:** The completed and signed form must be submitted to the DCM Inspector at the pre-construction conference for:
- All new buildings to be constructed on the grounds of new public K-12 (including Charter) schools awarded after July 1, 2010.
  - All new buildings containing classrooms or dorm rooms to be constructed on the grounds of all public 2-year or 4-year institutions of higher education awarded on or after August 1, 2012.
  - **State Agency/Authority projects when assigned to DCM.**

DCM (BC) Number: \_\_\_\_\_

PSCA Projects: PSCA Number: \_\_\_\_\_

Date of the Construction Contract: \_\_\_\_\_

## Contractor's Affidavit of Payment of Debts and Claims

<b>To Owner</b> ( <i>Entity name and address</i> ):	<b>Project</b> ( <i>Same as appears in the Construction Contract</i> ):
---	---

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. DCM Form C-20, Consent of Surety to Final Payment, may be used for this purpose.

Indicate attachment:     Yes     No

The following supporting document should be attached hereto if required by the Owner:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.
3. Contractor's Affidavit of Release of Liens, DCM Form C-19.

**Contractor** (*Insert company name and address*):

By: \_\_\_\_\_  
Signature of authorized representative

\_\_\_\_\_  
Name and Title

Sworn to and subscribed before me this \_\_\_\_\_ day  
of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary Public's Signature

My commission expires: \_\_\_\_\_

Seal:

DCM (BC) Number: \_\_\_\_\_

PSCA Projects: PSCA Number: \_\_\_\_\_

Date of the Construction Contract: \_\_\_\_\_

## Contractor's Affidavit of Release of Liens

<b>To Owner</b> ( <i>Entity name and address</i> ):	<b>Project</b> ( <i>Same as appears in the Construction Contract</i> ):
---	---

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Construction Contract referenced above.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.

**Contractor** (*Insert company name and address*):

By: \_\_\_\_\_  
Signature of authorized representative

\_\_\_\_\_  
Name and Title

Sworn to and subscribed before me this \_\_\_\_\_ day  
of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary Public's Signature

My commission expires: \_\_\_\_\_

Seal:

DCM (BC) Number: \_\_\_\_\_

PSCA Projects: PSCA Number: \_\_\_\_\_

Date of the Construction Contract: \_\_\_\_\_

Surety's Bond Number: \_\_\_\_\_

## CONSENT OF SURETY TO FINAL PAYMENT

<b>To Owner</b> ( <i>Entity name and address</i> ):	<b>Project</b> ( <i>Same as appears in the Construction Contract</i> ):
---	---

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

**Surety** (*Insert name and address of Surety*)

on bond of

**Contractor** (*Insert name and address of Contractor*)

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to

**Owner** (*Insert name and address of Entity*):

as set forth in said Surety's bond.

**SIGNED AND SEALED** this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

**SURETY:**

Seal:

\_\_\_\_\_  
Company Name

By \_\_\_\_\_  
Signature of Authorized Representative

\_\_\_\_\_  
Printed Name and Title

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each of the original forms to be attached to each of the four (4) final payment forms.

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**SECTION 01 0150  
SPECIAL CONDITIONS**

**1.01 TIME FOR COMPLETION OF WORK:**

- A. The Contractor may proceed to award sub-contracts, assemble materials, etc., after written "Notice To Proceed" with Work is given by the Owner. The Contractor's official time for construction to start on work shall be the date of the Owner's written "Notice to Proceed" with Work; and completion of the Work shall be within **FIVE HUNDRED FORTY DAYS(540) consecutive calendar days** from the official Notice to Proceed.
  - 1. Properly supervised work, per requirements, will be permitted on Saturdays and Sundays.
- B. Acceptance of the completed Work of this Contract will be at a single date, and not in phases, unless otherwise indicated.
- C. Nothing in the Contract Documents shall permit or be construed to permit payment to the Contractor for any extended overhead or profit due to completion of the project extending beyond the Contractual completion date. In no event shall the Owner or Architect be liable to the Contractor for damage due to any delay to any portion of the Work of this Contract.
- D. Delays: See Article 23 of General Conditions of the Contract, and Modifications to General Conditions of the Contract..

**1.02 LIQUIDATED DAMAGES:**

- A. Actual damages for delay in completion may be impossible to determine, and the Contractor shall be liable for and the Owner shall deduct as liquidated damages from the final payment due the Contractor, the following, in addition to 6% per annum of the total contract amount:
  - 1. For each calendar day of delay in completion of any part of the work beyond the number of days specified, the sum of \$250.00.
  - 2. In the event that work on this project is incomplete and ongoing after the contractual completion date, beginning at ten (10) additional days thereafter, the Owner will also charge the Contractor, an additional \$250.00 per day, for the Owner's nominal reimbursement to the Architect for continued work on the project, which charges will continue until "Substantial Completion" is accomplished.
- B. The submittal of a Bid and/or Proposal by any Contractor and their Subcontractors shall be construed as, in part, acknowledgement and acceptance of these provisions.

**1.03 SITE RESTRICTIONS:**

- A. The limits of work and known restrictions are indicated on the Site Plan and various portions of the Drawings and the Project Manual.
  - 1. Refer also to Section 01 1000 - "Summary of The Work," for additional information and requirements.

**1.04 PRE-BID CONFERENCE:**

- A. Refer to "Advertisement for Prequalification and Bids" and "Supplementary Instructions to Bidders," for additional information and requirements.

**1.05 PRE-CONSTRUCTION CONFERENCES:**

- A. Refer to Section 01 3000 - "Administrative Requirements".
- B. Prior to commencing any work on the project, a pre-construction conference shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the project. Time and date of said conference shall be established by the Architect in conjunction with the State Inspector, Owner, and General Contractor, after award of

construction contract.

- C. A Pre-Construction meeting shall not be conducted until both (1) the permit fee and (2) the signed Construction Contract have been received by the Alabama Division of Construction Management in accordance with the Code of Alabama 1975, 41-9-141 (a)(8) Alabama Division of Construction Management Administrative Rule 170X-8.

**106 PRE-ROOFING CONFERENCE:**

- A. A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, Division of Construction Management Inspector General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable) and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.
- B. The pre-roofing conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.
- C. The following are to be accomplished during the conference:
  - 1. Review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
  - 2. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
  - 3. Establish roofing schedule and work methods that will prevent roof damage.
  - 4. Require that all roof penetrations and walls be in place prior to installing the roof.
  - 5. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
  - 6. Establish weather and working temperature conditions to which all parties must agree.
  - 7. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.
- D. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor, the Division of Construction Management and the Owner.
- E. Refer to Section 01 3000 - "Administrative Requirements" for additional information and requirements.

**107 CONTRACTOR ACCESS TO SITE:**

- A. The Contractor will have access to the site immediately upon receipt of the Owner's written Notice to Proceed with work. All routes of access to the site and gate locations by the Contractor or their subcontractors, are subject to approval by Owner, Architect, and other authorities having jurisdiction. Check site plan for location of work limits. Refer to Section 01 1000 - "Summary of The Work" and Section 01 5000 - "Temporary Facilities," for additional information and requirements.
- B. The Contractor shall be required to coordinate the Work of the project with the Owner's activities, to the extent that the Work of this Contract has little or no effect on normal operations.



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**1.08 CONTRACTOR'S PLAN FOR CONSTRUCTION OF PROJECT:**

- A. Contractor shall prepare and submit within 7 days from award of contract to the Architect for review and approval a Bar Graph, indicating his proposed plan and sequence of operations to complete each phase of this project, on schedule as required by contract. This Bar Graph is not expected to be a Critical Path graph.
  - 1. Schedule should identify project milestones and expected durations.
- B. Refer to Section 01 3216 - "Construction Progress Schedule" for additional information and requirements.

**1.09 CONTRACTOR JOB MEETINGS:**

- A. On-Site Meetings with Architect, and various trades, general contractors and subcontractors, shall be conducted by the Contractor as directed by the Architect for purpose of furthering the progress of the work, solving construction problems, and issuing instructions.
- B. Refer to "Pre-construction Conferences" paragraph above, "General Conditions of the Contract", and Section 01 3000 - "Administrative Requirements" for additional information and requirements.

**1.10 STORED MATERIALS:**

- A. It is recognized that the size of the site is restrictive and that it may be necessary for the Contractor to store some materials for project at locations on the site, prior to removal or disposal. When such on site storage is necessary, comply with requirements of authorities having jurisdiction, including in part, on site retention of earth, storm water run-off, slopes of debris, earth, etc.
- B. Store items to be incorporated in the Work in stable and secure manner, off of ground, separated by hardwood or treated wood blocking, and under cover or in storage building.
  - 1. Any materials found stored directly on ground or paving, in standing water, etc., will be rejected, immediately removed from site, and replaced with new materials at the Contractor's expense.
  - 2. Distribute materials around framing and the roof in such manner as to prevent any damage to structure, construction, improvements, etc.
- C. Refer to Section 01 6000 - "Product Requirements", for additional information and requirements for any off-site stored materials.

**1.11 PROTECTION:**

- A. The Contractor shall provide and maintain adequate fencing and barricades, where indicated, and wherever required. Building entrances and exits shall remain unobstructed at all times when buildings are occupied.
- B. The Contractor shall provide suitable protection for all employees, the public, students, children, users of other adjacent facilities, and the occupants of existing buildings at all times during the execution of and until the completion of the Work.
  - 1. Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.
- C. The Contractor shall avoid damage as a result of their operations, to the existing buildings, walks, pavement, curbs, grass, shrubbery, trees, utilities, adjoining property, etc., and shall at his/her own expense, completely repair any damage thereto caused by his operations. All repair work is subject to Architect's approval, and that of its Owner.
- D. Refer to Section 01 5000 - "Temporary Facilities and Controls" for additional information and requirements.

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**1.12 WORK LIMITS PROTECTION:**

- A. The Contractor shall locate all temporary buildings, storage of equipment, materials, etc., within a protected area to protect the public, students, children, and others from the construction activities. Type and location of such protection shall be as existing at the site, or if not existing or complete, as proposed and furnished by the Contractor, subject to acceptance of the Architect, Owner, and authorities having jurisdiction.
  - 1. All such fencing shall be removed upon completion of the work of this project, removed from the site, and any post holes filled and compacted same as adjacent grade or paving, by the Contractor.
  - 2. Responsibility and maintenance of such fencing and areas within such fencing shall be held by this Contractor beginning at the date of notice to proceed and until its removal, close to the date.
- B. Refer to Section 01 5000 - "Temporary Facilities and Controls" for additional information and requirements.

**1.13 EMPLOYMENT OF AND PAYMENT FOR TESTING SERVICES:**

- A. The following information regarding Employment of and Payment for Testing Services under the work of Specifications shall take precedence over any conflicting statements otherwise, which may have remained in the Project Manual after editing:
  - 1. Initial testing required by the Contract Documents for Divisions 2 through 5, and Divisions 31-33 (except not utility systems testing) shall be provided by an independent testing agency selected, employed and paid by the Owner.
  - 2. Initial testing required by the Contract Documents for all other testing and Divisions 6 through 26 shall be provided by a testing agency acceptable to the Owner, and selected, employed, and paid by the Contractor from his/her Contract amount.
  - 3. Any retesting required (due to failure of initial testing to meet the requirements of the Contract Documents) shall be at the Contractor's expense.
  - 4. Any retesting required (due to questionable materials or construction methods, for verification purposes, and etc.) shall be at the Contractor's expense when the results of such retesting indicate any work or materials do not comply with requirements of the Contract Documents. Otherwise, such retesting will be at Owner's expense.
  - 5. Any retesting under the above provisions shall be performed by the same Owner accepted testing agency.
  - 6. Nothing in the Contract Documents shall prevent the Contractor from performing any other or additional Quality Control testing at his/her own expense, to verify compliance with the Bid and Contract Documents.
- B. The Contractor shall be responsible for contacting and directions to the accepted testing agency and for any follow-up communications required, for all testing required by the Contract Documents.
- C. No unsuitable or unsatisfactory existing soils or building materials (other than work in Contract) shall be removed without either the presence of or concurrence of and prior approval of the Architect and the accepted testing agency, so as to assure quality of the Work is maintained, and to verify quantities of any additional work under bid "Unit Prices", for which the Contractor is due payment by the Owner.
- D. The Contractor shall be responsible for contacting and directions to the accepted testing agency and for any follow-up communications required, for all testing required by the Contract Documents.
- E. Refer to Section 01 4000 - "Quality Requirements" for additional information and requirements.

**1.14 PROHIBITED MATERIALS:**

- A. ASBESTOS: All materials, equipment, components, accessories, and etc., installed in the work of this contract, both field installed and bought-out manufactured items from any source shall be 100-percent free of asbestos.

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- B. **LEAD CONTENT:** All water-bearing lines, water dispensing equipment, finish materials, and paint other than exposed exterior roof flashings, shall be 100-percent free of lead.
  - C. **CALCIUM CHLORIDE:** Calcium chloride and/or derivatives or additives thereof shall not be permitted in any concrete, concrete product, grout, masonry and/or mortar.
  - D. **ENVIRONMENTAL REGULATIONS:** All materials, their application, installation, and completion, shall comply with applicable environmental regulations, including in part, erosion, air-borne contaminants, and volatile organic compounds (VOC's).
  - E. **FORMALDEHYDE:** All insulation and other products shall be 100-percent free of formaldehyde.

**1.15 PROHIBITED EQUIPMENT:**

- A. The elevated and framed floor slabs are not designed to accommodate heavy rolling point loads. Scissor lifts are not permitted on any elevated or framed slab during the construction of the project.

**1.16 PROJECT SIGNS:**

- A. Install and maintain PROJECT SIGN, as per Detail following Section 01 5813 - Project Signs, at location on site as directed by the Owner or Architect. Any statements elsewhere which may omit Project Sign are hereby not withstanding.
  - 1. Sign shall be in place within number of days specified in Section 01 5813, and shall be removed within five days of the date all work on this project has been completed.
- B. Provide, securely install and maintain prefinished metal signs on each side of each gate leaf and at 50'-0" o.c. maximum on street/public side of all construction fencing provided (if any).
  - 1. Copy: "NO TRESPASSING
  - 2. DANGER
  - 3. CONSTRUCTION AREA"
  - 4. Size: Approximately 1'-6" wide x 1'-0" high.
- C. Provide other pedestrian and vehicular signs as necessary and required, in compliance with requirements of authorities having jurisdiction. Signs shall remain on site for duration of this Contract.
- D. General Contractor may have a sign on his/her Construction Office and as needed for delivery directions only.
- E. Subcontractors will not be allowed to post signs.
- F. Refer to Section 01 5813 - "Project Signs" for additional information and requirements.

**1.17 PERSONNEL EXPERIENCE AND SUPERINTENDENTS:**

- A. Subcontractors shall have no less than 5-years verifiable experience in their trade and no less than 5-years verifiable experience in their business enterprise contracting for work under this project; The type of work subcontracted for this project shall be the principal business of the Subcontractor.
- B. Superintendents and foremen, or other individual in the lead or supervisory position for any portion of the Work under this Contract shall have no less than 7-years verifiable experience in performing the type of work they are responsible for.
  - 1. The Contractor shall submit resumes of work and project experience for their Superintendent and foremen, as soon as possible and at least within five calendar days of receipt of the Contract to be executed for the work, for review and acceptance by the Owner and Architect.
  - 2. If the Superintendent is replaced on the job after work begins, the same qualifications as above apply. Submit for review and acceptance by the Owner and Architect.

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**1.18 SUBMITTALS:**

- A. Submittal requirements are indicated throughout the Contract Documents, and the following supplements those requirements.
1. Electronic Document Submittal Service will be used for administration of the Contract. See Section 01 3000 - Administrative Requirements.
  2. Contractor will be required to make submittals for every item and product so indicated; Also upon request, for any additional or other item or products intended for use or incorporation in the Work.
    - a. The Contractor shall submit to the Architect within 30 days of "Notice to Proceed", a complete listing of all required submittals, warranties, guarantees, close-out documents, and materials requiring extra or "attic" stock delivered to the Owner, for review and acceptance. Include for each item, the anticipated date of Submittal to the Architect. Re-submit until accepted or approved.
  3. The Contractor shall review, mark all necessary changes, revisions, and questions; and then stamp, sign, approve, and submit to the Architect, all Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, and shall do so with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner, or of separate contractors.
    - a. The Contractor shall not make submittals to the Architect which they have not reviewed, stamped, signed and approved by the Contractor; or in such case, no action will be taken by the Architect or their Consultants regarding that or those submittals.
  4. The Contractor shall submit number of copies for review as indicated in Section 01 3000 - Administrative Requirements.
  5. Review time will be limited to two weeks, except for more complex submittals, such as Structural, and Divisions 21-26.
  6. Colors will not be selected until most or all submittals required have been received and reviewed. Actual color chip samples shall be required along with standard color selection paperwork. No exceptions.
  7. Samples: Submit the number specified in Section 01 3000.
  8. Submit test reports as required or otherwise requested, in the same quantity as other submittal data.
  9. Contractor shall provide letter from Mechanical Contractor stating the Mechanical Contractor has coordinated all power requirements with the Electrical Contractor. Mechanical submittals will not be reviewed without receipt of this letter.
  10. Contractor shall distribute reviewed submittals to all concerned and appropriate Subcontractors and Suppliers.
  11. Contractor shall maintain 1-set of reviewed and approved submittals at his on-site job office.
- B. Review and/or approval of submittals by the Architect, Owner and/or their Consultants shall not relieve the Contractor of his responsibility to comply with the requirements of the Contract Documents.
1. Any proposed change in the Work shall be submitted separate from any other item during construction, with same documentation as pre-bid requests, or they will not be considered.
  2. No actual or proposed change shall be included in Shop Drawings or other Construction submittals, and none so included will be considered approved under any circumstances.
  3. Shop Drawings are communications between the Contractor and various suppliers, fabricators, and subcontractors. The design professional's role is to review the drawings to answer questions that arise about design intent.
  4. Even if a reviewed Shop Drawing or other Submittal has deviations from the original design and the Contract Documents, it in itself is not a Change Order and it is not, IN ITSELF, an approval of the change. Changes can only be approved by Change Order.
  5. Dimensions, quantities, and coordination remain the Contractor's responsibility.

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- C. Refer to Section 01 3000 - "Administrative Requirements" for additional information and requirements.
  - D. The General Contractor shall submit a schedule of submittals for approval to the Design Consultant, itemizing all required submittals within ten (10) days of receiving the Notice to Proceed.
  - E. All shop drawings and/or submittals shall be dated and numbered sequentially. A re-submittal shall be designated by adding an "R" to the original submittal number.
  - F. All shop drawings and submittals shall be coordinated with all respective trades and approved by the General Contractor as so coordinated prior to submission to Design Consultant. Shop drawings and/or submittals not approved and stamped by the General Contractor shall be returned to Contractor.
  - G. Truss design submittals, if required, shall be specifically approved by the General Contractor and mechanical subcontractor prior to Design Consultant's review.
  - H. All shop drawings and/or submittals shall be submitted sufficiently in advance of construction requirements to allow checking, correcting, resubmitting, and rechecking.
  - I. Once the Design Consultant has approved a submittal, one set shall be delivered to the Program Manager with a copy of the completed Material Submittal Approval form. The Design Consultant shall indicate the status of the submittal on the form.
  - J. Unless specifically requested by the Design Consultant, submittals marked "Approved as Noted" or "Approved as Corrected", need not be resubmitted.
  - K. A copy of Submittals marked "Rejected" or "Revise and Resubmit" by the Design Consultant as well as the Material Approval Submittal form should be provided to Program Manager. The Design Consultant shall indicate the status of the submittal on the transmittal sheet.
  - L. The Design Consultant reserves the right to withhold approval of interior and exterior finishes until all related submittals and shop drawings are received.
  - M. The General Contractor, Design Consultant and Program Manager shall utilize the internet-based project management system described in Section 01315 of this Project Manual to track and record submittals.

**1.19 SITE MAINTENANCE:**

- A. The Owner will require all mud or debris resulting from this construction to be removed from streets, sidewalks, etc., by the Contractor as it appears, one or more times daily.
- B. Trash, debris, etc., must be removed from the site as Contractor's trash cans, waste receptacles, etc., are filled. Same will not be allowed to accumulate or blow around the site, within the buildings, etc.
- C. The Contractor shall be responsible for maintaining existing landscaping and lawns within and below any construction fencing, for the duration of the Work of the Contract, or until any such fencing is removed.
- D. Refer to Sections 01 1000, 01 5000, 01 7000 and other locations in the Bid and Contract Documents for additional information and requirements.

**1.20 INSURANCE AND SPECIAL PROVISIONS:**

- A. The Contractor and their insurer, by execution of the Contract, shall waive all rights of subrogation against "the Owner, the Architect, and their Consultants", and same shall be indicated on all insurance provided by the Contractor and each Subcontractor.
- B. The Contractor and their insurer, and each Subcontractor, shall name "the Owner, Architect, and their Consultants", as additional named primary insureds on all insurance provided by the Contractor and each Subcontractor, except not for "Workers Compensation and Employers Liability".
- C. Refer to "General Conditions" and other portions of the Bid and Contract Documents, for additional information and insurance requirements. Note that Builder's Risk insurance is required, as described in "General Conditions", as modified by "Supplementary Conditions".

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1. Extent of coverage required and/or any approval or acceptance of the insurance carried shall not act to modify the liability of the Contractor, nor to imply that the limits, features and/or coverages described are adequate to protect the interests or exposures of the Contractor.
  - D. The Contractor shall “hold harmless” and indemnify the Owner, Architect, and their Consultants from any claim or legal action resulting from any circumstances related to the Work of this project, including in part, payment of any legal or other expenses, fines, judgments, etc.
  - E. Insurance policies required by the Contract Documents shall not be canceled, altered, or changed, without first having given thirty (30) days written notice to the Owner, with a copy sent to the Architect, except ten(10) days written notice for non-payment of premium.
    1. Copies of all policies, endorsements, and insurance certificates, including new, renewed, altered, and/or changed during this Contract shall be delivered to the Owner within ten (10) days of effective date(s), with a copy sent to the Architect, by the Contractor.
  - F. Refer to General Conditions of the Contract for additional information and requirements regarding minimum insurance and indemnity requirements.
  - G. Special Provision: Nothing in this or other paragraphs of the Contract Documents shall create or give to third parties any claim or right of action beyond such as may legally exist irrespective of the Contract.

**1.21 ACCESSIBILITY OF ALL COMPLETED WORK:**

- A. All products and installations of the Work of this Contract, shall be as designed by the fabricator, manufacturer, etc., and installed by the Contractor, Subcontractors, etc., so as to provide full accessibility to people with disabilities, unless specifically indicated otherwise. This shall include in part, the following:
  1. Mounting heights of all electrical devices, switches, etc., all designated plumbing fixtures, and their operation, in all areas except mechanical and electrical rooms, and service areas which are not accessible at any time to the public or Owner’s administrative (not service or maintenance) personnel.
  2. Signage.
  3. Door operation and hardware.
  4. Elevator (if any).
  5. Slip resistance of all completed flooring and walkway surfaces both interior and exterior.
- B. Comply with the more stringent requirements of at least the following, either the latest edition or latest adopted edition of the locality, and all revisions and amendments thereto:
  1. American National Standards Institute (ANSI), ANSI A 117.1.
  2. D.O.J. ADA Standards for Accessible Design.
  3. International Building Code, as applicable at the project locale.

**1.22 CONTRACTOR PROGRAMS AND CONDUCT OF PERSONNEL:**

- A. The Contractor shall implement programs and make literature available to all construction and administration personnel to encourage making this project a safe place to work, including in part the following requirements: A project site free of any substance abuse, which does not allow any consumption of alcohol, and which does not allow any work to be performed while under the influence of any debilitating substance.
  1. The Contractor and every Subcontractor shall have as part of their personnel, safety, substance abuse prevention, and/or quality programs, mandatory drug testing at pre-employment, post-accident, and at random during employees’ tenure with their firms. Each such entity shall be prepared to provide non-confidential verification to the Owner that such testing is consistently on-going, upon Owner’s request for same.
- B. Programs shall be as acceptable to or recommended by one or more of the following:

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1. Contractor's Underwriter for Worker's Compensation or liability insurance.
  2. OSHA.
  3. Associated General Contractors.
  4. U.S. Department of Defense, Corps of Engineers, or Veterans Administration.
- C. Conduct of all personnel employed for the Work of this project shall be held to a high standard and shall not be offensive to others on or around the site, including in part, pedestrians, the public, the Owner, Owner's Consultants, etc.
1. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representative named in the front of this Project Manual, inspecting authorities with jurisdiction, and the Architect; In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
  2. The Contractor's personnel and Subcontractors shall not enter the Owner's building, nor use the Owner's telephones (except in emergencies), or the Owner's restrooms.
- D. The Contractor shall immediately dismiss and escort off of the project site, any personnel who are obviously under the influence of alcohol or other debilitating substance, and any personnel exhibiting offensive behavior as described above or by law or by local statute or regulations of authorities having jurisdiction.

**123 WORK BY OTHERS:**

- A. The following items of work are to be provided by others, and are Not in Contract (N.I.C.). The Contractor will be required to coordinate with the Owner as necessary to accommodate provisions for these items.
1. Movable furniture, furnishings, office equipment, library equipment, and movable library shelving unless otherwise indicated.
  2. Listed Equipment, residential appliances, and items of Alternate work not accepted at this time, and/or indicated "Not In Contract", "N.I.C.", "Future", and/or similar indication.
    - a. Unless otherwise indicated, coordination, locating, and providing rough-ins for all power, water supply, gas, drains, drain lines, condensate drain outlet, and other utilities required for such equipment, casework, etc., and preparation required for the addition of future finishes (same as level of finish required for the finishes included in Bid, just prior to finishes being added), shall be included in Base Bid;
- B. Refer to Section 01 1000 - "Summary of The Work" for additional information and requirements.

**124 INSPECTIONS:**

- A. The Contractor's Job Superintendent shall submit to the Program Manager and to the Design Consultant, daily construction reports detailing all construction activity taking place each day. The daily construction reports shall indicate at minimum: the number of employees on site, the number of subcontractors and subcontractor's employees on site (listed by firm), a brief description of work activities, description of any delays and/or problems incurred, any interference with work and/or among trades, and weather conditions throughout the day. The daily report shall be accompanied by a daily sign-in sheet documenting personnel present on site. Each daily report shall indicate the date and time, and be submitted in sequence. The report shall be submitted by 10:00 a.m. the following day.
- B. The General Contractor's Superintendent or designated representative shall inspect all work performed by the General Contractor and all subcontractors. Upon his approval of the work, and after any and all required corrections to the work have been completed, the Design Consultant and Program Manager shall be notified in writing that the construction is ready for inspection. All items found by the Design Consultant in conjunction with Program Management which are not in conformance with the Contract Documents shall be corrected before local officials are called to perform inspections or tests.

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- C. See Section 01 3000 - Administrative Requirements for information on Scheduling of Inspections, and Minimum Requirements for Required Inspections.

**1.25 DCM USER FEES:**

- A. The Contractor is hereby advised of the State of Alabama Division of Construction Management's "User Fees". Pursuant to Administrative Rule 355-16-1 Collection of User Fees effective January 13, 2020, all projects under the jurisdiction of DCM require payment of fees at various points during the project for plan review, permitting/inspections and, if applicable, contract document administration.. The Rule for "Collection of User Fees" may be obtained at the following link:
1. <<http://www.alabamaadministrativecode.state.al.us/docs/fin/355-16-1.pdf>>
- B. The Contractor is also hereby advised that Alabama Division of Construction Management administrative fees in the form of a Permit Fee shall be paid by the Contractor.
1. See attached Permit Fee Calculation Worksheet.
- C. Special Attention is called in part, to Chapter 355-16-1-.03 "Fees Required", (5) Additional Fees, Subparagraph b, below:
1. Any fees incurred under this paragraph will be the sole responsibility of the General Contractor, at no cost to the Owner, with payment made as directed by the Alabama Division of Construction Management.
    - a. "If the contractor schedules an inspection and it is determined by the Building Commission Inspector on site that the contractor is not ready for the scheduled inspection, the Building Commission shall require an additional fee of \$1500. The additional inspection fee shall be applied to each additional inspection that is required to be rescheduled."

**1.26 REINSPECTION CHARGES:**

- A. The Contractor is hereby advised of the State of Alabama Building Commission's "User Fees", which go into effect on October 1, 2014. The new Rule for "Collection of User Fees" may be obtained at the following link:
1. <<http://origin.library.constantcontact.com/download/get/file/1102218988415-447/Revised+-+Building+Commission-Proposed+Administrative+Rule+170X-8.pdf>>
- B. Special Attention is called in part, to Article 170-X-8-.03 "Fees Required", (5) Additional Fees, Subparagraph b, below:
1. Any fees incurred under this paragraph will be the sole responsibility of the General Contractor, at no cost to the Owner, with payment made as directed by the Alabama Building Commission.
    - a. If the contractor schedules an inspection and it is determined by the Building Commission Inspector on site that the contractor is not ready for the scheduled inspection, the Building Commission shall require an additional fee of \$1500. The additional inspection fee shall be applied to each additional inspection that is required to be rescheduled."

**1.27 INTENT OF DRAWINGS AND CONTRACT DOCUMENTS**

- A. Clarification of any conflict in or between Contract Documents shall be made only by written Addenda during the bid period and sent to all prospective Bidders. The Program Manager and Design Consultant shall not be responsible for verbal answers regarding intent or meaning of the Contract Documents, or for any verbal instructions, by whomsoever made, prior to the award of the Contract.
- B. All designed systems and/or assemblies are to be proposed and bid as complete assemblies or operational systems. Drawings are to be construed as an indication of intent and not attempting to fully obtain or detail required work.



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**128 COPIES OF DRAWINGS AND SPECIFICATIONS**

- A. The cost of all Contract Documents required for the construction of the specified work, as determined by the Contractor, shall have been included in his Proposal.

**129 NOTICE TO PROCEED**

- A. The Contractor may proceed to award subcontracts, assemble materials, etc., at any given time after Award of Contract and the Notice to Proceed with the work has been issued. For the purpose of liquidated damages, the Contractor's official time for the starting of construction work shall be the actual date of the Notice to Proceed which shall be issued by the Owner or the Design Consultant on behalf of the Owner.

**130 SHOP DRAWINGS AND SUBMITTALS**

- A. The General Contractor shall submit a schedule of submittals for approval to the Design Consultant, itemizing all required submittals within ten (10) days of receiving the Notice to Proceed.
- B. All shop drawings and/or submittals shall be dated and numbered sequentially. A re-submittal shall be designated by adding an "R" to the original submittal number.
- C. All shop drawings and submittals shall be coordinated with all respective trades and approved by the General Contractor as so coordinated prior to submission to Design Consultant. Shop drawings and/or submittals not approved and stamped by the General Contractor shall be returned to Contractor.
- D. Truss design submittals, if required, shall be specifically approved by the General Contractor and mechanical subcontractor prior to Design Consultant's review.
- E. All shop drawings and/or submittals shall be submitted sufficiently in advance of construction requirements to allow checking, correcting, resubmitting, and rechecking.
- F. Once the Design Consultant has approved a submittal, one set shall be delivered to the Program Manager with a copy of the completed Material Submittal Approval form. The Design Consultant shall indicate the status of the submittal on the form.
- G. Unless specifically requested by the Design Consultant, submittals marked "Approved as Noted" or "Approved as Corrected", need not be resubmitted.
- H. A copy of Submittals marked "Rejected" or "Revise and Resubmit" by the Design Consultant as well as the Material Approval Submittal form should be provided to Program Manager. The Design Consultant shall indicate the status of the submittal on the transmittal sheet.
- I. The Design Consultant reserves the right to withhold approval of interior and exterior finishes until all related submittals and shop drawings are received.
- J. The General Contractor, Design Consultant and Program Manager shall utilize the internet-based project management system described in Section 01315 of this Project Manual to track and record submittals.

**131 REQUESTS FOR INFORMATION**

- A. Request for Information (RFI) shall be sequentially numbered and submitted to the Design Consultant using the internet based (eBuilder) project management system as described in Section 01315 of this Project Manual.
- B. The RFI shall contain sufficient, specific, information to provide the Design Consultant with a clear understanding of the item or concerns in question. The Contractor may include additional information in the form of photographs, diagrams, or other pertinent documentation, to assist in the clarification of the RFI.
- C. The Design Consultant shall provide an answer to the Contractor in the space provided on the RFI form. Should additional information be required for the Design Consultant response, that information shall be

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attached to the RFI form.

- D. A copy of the completed Request for Information form shall be provided to the Program Manager.
- E. Failure to submit a written RFI to the Design Consultant may negate a Contractor's claim for additional time or payments should a Design Consultant fail to respond to an RFI in a timely manner.
- F. The General Contractor, Design Consultant and Program Manager shall utilize the internet-based project management system described in Section 01315 of this Project Manual to track and record RFIs.

**1.32 PROGRESS SCHEDULE**

- A. A CPM Project Schedule for Construction, as described below, shall be prepared and is the responsibility of the Contractor. Subcontractors and suppliers participating in the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved project schedule shall be used to measure the progress of the work, aid in evaluating time extensions, and to provide the basis for all progress payments.
- B. The CPM schedule shall be the basis for measuring Contractor progress. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire project schedule submission and the inability of the Program Manager and Design Consultant to evaluate Contractor progress for payment purposes.
- C. Project Schedule - General Requirements
  - 1. In preparation of the schedule, the Contractor shall comply with the procedures outlined in AGC's "Construction Planning & Scheduling".
  - 2. The schedule's time frame should be extended from the date of Notice to Proceed through the date of Substantial Completion and Final Completion as established by the contract documents.
  - 3. The schedule shall include an appropriate and reasonable level of detail to allow for accurate monitoring of project progress. Items to be included in the schedule shall be further described below.
  - 4. The schedule shall be prepared using input from the General Contractor's subcontractors and suppliers.
  - 5. The initial schedule shall be submitted within 15 calendar days of Notice to Proceed, unless otherwise specified elsewhere in these specifications.
  - 6. The schedule shall be updated a minimum of once per month with Design Consultant approved time extensions as necessary. An updated schedule shall be submitted with the Contractor's application for payment, and also posted on the internet based project management system described in Section 01315 of this Project Manual. Failure to submit an updated schedule with the application for payment may cause the application for payment to be rejected.
- D. Contractor's CPM Construction Schedule
  - 1. Scheduling Consultant: At the Contractor's option, the Contractor may retain a scheduling consultant to prepare and update the construction schedule. The scheduling consultant, if utilized, shall attend all meetings relating to project progress, delays or time impacts. The Program Manager may elect to waive the requirements to retain a scheduling consultant should the Contractor employ skilled personnel qualified in the preparation and reporting of CPM schedules.
  - 2. Level of Detail and Items to be Included in Schedule.
    - a. Activity Duration: Define activities so that no activity has a duration of more than 30 days unless specifically approved by Design Consultant and Program Manager.
    - b. Procurement and Submittal Activities: Include procurement process activities for long lead time items. A long lead-time item is defined as one with a lead-time of more than 30 days. Procurement activities are to be broken down into submittals (submittal review and approval time should be incorporated into the submittal activity duration), purchasing and fabrication / delivery.

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- c. Start-up and Testing Time: Include activity line items for start-up and testing.
  - d. Owner Activities: Owner activities that could impact progress shall be included as separate activities in the project schedule. This includes work to be performed by Owner Direct Contractors. An example of an owner activity would be delivery and set-up of portables.
  - e. Milestones: Include milestones for critical days or events in the schedule. As a minimum, milestones should be established for Notice to Proceed, Substantial Completion and Final Completion.
- E. Schedule Layout and Presentation.
- 1. The schedule shall be in Gantt chart format with the critical path activities clearly delineated from those activities containing float time.
  - 2. Each activity bar shall be labeled with the activity name adjacent to its representative bar.
  - 3. Milestone activities shall be represented by a unique symbol on the Gantt chart, demarcating them from other activity bars.
  - 4. The schedule shall display logic arrows linking predecessor and successor activities. All activities must have a predecessor and a successor constraint except the Notice to Proceed activity (which will have no predecessor) and the Final Completion activity (which will have no successor).
  - 5. The head of the schedule shall include columns for the following activity information:
    - a. Activity ID
    - b. Activity Name/Description
    - c. Duration
    - d. Late Start
    - e. Actual Start
    - f. Early Finish
    - g. Late Finish
    - h. Actual Finish
    - i. Total Float
  - 6. A minimum of three copies of the schedule shall be submitted at each schedule submission.
- F. The schedule shall be updated a minimum of once per month and should coincide with the submission of the Contractor's application for payment. Failure to submit an updated schedule with the application for payment may cause the application for payment to be rejected.
- 1. Should the Program Manager or Design Consultant deem that the project is running behind schedule, the Program Manager or Design Consultant can request that the schedule be updated more frequently.
  - 2. The initial approved schedule shall be designated as the baseline schedule and shall represent the anticipated sequencing and activity duration of the construction project. The baseline schedule will be the schedule referenced against the updated schedule to determine schedule progress and the effect of changes. Each update will become the baseline for the subsequent update.
  - 3. When performing the schedule update, actual start and finish dates for each activity shall be used. Automatic updates using default settings inherent in the scheduling software will not be allowed.
  - 4. When reporting the schedule, the baseline and updated schedules shall be displayed on the same chart in order for the as-built condition to be easily compared against the baseline.
  - 5. Activity progress shall be clearly indicated on the activity bar as a superimposed progress bar.
  - 6. With the updated schedule provide a report of every change including, but not limited to changes in logic, actual start and finish dates and activity durations.
- G. Requests for Time Extensions
- H. The CPM schedule shall be the basis by which a determination will be made as to whether or not the Contractor is due an extension of time under the provisions of the contract.
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- I. For each delay or time extension claim, the Contractor shall submit a justification report that should include the following items:
    - 1. A brief explanation of the cause of the change.
    - 2. A CPM schedule incorporating the change and clearly depicting the impact to the final completion date of the project using the latest updated schedule as a baseline.
    - 3. Delays that are the sole responsibility of the contractor will not be considered as reason to grant time extension to the final completion date for the contract.
  - J. Program Manager
    - 1. Should the project's budget and/or schedule become a concern for the Owner, the Program Manager shall maintain the latitude, at its discretion, to institute time and cost control measures during the construction phase of the work which, in general, shall provide better Owner control in expediting the timely completion of the project. Design, Program Management, and Owner personnel reserve the right to visit the site and observe work in progress at any given time.

**1.33 METHOD OF RECOVERY**

- A. A Scheduling Meeting shall be held at the end of each month, or more frequently as determined by the Program Manager. The purpose of this meeting shall be for the Program Manager and/or his representative to meet with all parties to discuss alternate solutions for updating and/or compressing construction schedules. At this meeting, if the Project is behind schedule in any area, the Contractor shall submit to the Program Manager, a Method of Recovery. The scheduling meetings may be incorporated into the regularly scheduled OAC meetings.
- B. The Contractor shall, with due diligence, make every effort to adhere to this construction schedule. Slippage of construction schedules shall not be tolerated. Schedule slippage without alternate solutions that shall allow the schedule to be recovered are grounds for Contract termination. Method of Recovery shall not increase the Contract amount.

**1.34 SCHEDULE OF VALUES**

- A. Prior to submitting the first Application for Payment, the Contractor shall provide to the Program Manager a schedule of values allocated to various portions of the Work, prepared in such form, and supported by all such data substantiating its accuracy, as the Design Consultant/Program Manager may require. This schedule, unless objected to by the Program Manager, shall be used as a basis for reviewing the Contractor's Applications for Payment.

**1.35 ELECTRICAL POWER AND JOB SITE UTILITIES**

- A. The General Contractor shall be responsible for the cost of all electrical power and all other utilities necessary for construction, until such time as the Substantial Completion date is established and agreed upon by all parties. Once the date of Substantial Completion has been established, said utilities shall be transferred into the Owner's name. Utility bills will be pro-rated, based upon the established date of Substantial Completion.

**1.36 APPLICATION FOR PAYMENT/PAY REQUESTS**

- A. All Applications for Payment shall be submitted to the Design Consultant for consideration, monthly on or about the 25<sup>th</sup> of each month. The Design Consultant and Program Manager shall then review all work and agree as to the percentage of completion of each phase of work in question. No approval of any pay requests shall be made until all of the involved parties are in agreement as to the stage and/or percentage of completion.
- B. Four original sets of each application are required: One for the Program Manager, One for the Design Consultant, and Two for the Owner.

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- C. The Design Consultant in conjunction with the Program Manager shall maintain the option to “red line” at its discretion, those items which, having been submitted for payment, are not properly documented or which are not properly documented as to support costs of Contract Change Authorizations or Change Orders.
  - D. With each Application for Payment the Contractor is required to submit the following:
    - 1. Contract Notice to Proceed Date
    - 2. Original Contract Completion Date
    - 3. Current Revised Contract Completion Date
    - 4. Number of Days Elapsed
    - 5. Percent of Time Elapsed
    - 6. Percentage of Contract in Place (Stored materials may be included)
    - 7. FEIN #
  - E. Such application shall be notarized and supported by such data as the Design Consultant in conjunction with the Program Manager may require as substantiating the Contractor's right to payment. A graph indicating the monthly projected and actual construction schedule shall be submitted each month with the Contractor's Application for Payment.
  - F. With the monthly Application for Payment, the General Contractor shall submit a Waiver of Lien for the value of the work completed.
  - G. Payment for materials stored off-site may not be requested unless materials are stored in an insured and bonded warehouse. Certificates of Insurance must be attached to the pay request. Copies of both the purchase order and copies of material invoices shall be submitted with the Request for Payment on which the stored materials are listed.
  - H. The Contractor's FEIN number must appear on all Applications for Payment.

**1.37 UNKNOWN CONDITIONS**

- A. If, in the performance of the Contract, subsurface or latent conditions are found to be materially different from those indicated by the Drawings and/or Project Manual, or unknown conditions of an unusual or impractical nature are disclosed differing materially from conditions usually inherent in work of the character shown and specified, the attention of the Design Consultant and the Program Manager shall be called immediately to such conditions before they are disturbed. Upon such notice, or upon such observation of conditions, the Owner may instruct the Design Consultant to promptly make such changes in the Drawings and/or Project Manual as he finds necessary to conform to the different conditions, and any increase or decrease in the cost of the Work resulting from such changes shall be adjusted as provided under CHANGES IN THE WORK or EXTRA WORK as set forth in the GENERAL CONDITIONS. All costs and claims including time extension are required to be included in the Contractor's response to Change Order Request or Request for Proposal. Claims for additional costs and/or time arising after approval shall be disallowed and this condition is accepted by the Contractor upon executing Owner/Contractor Agreement.

**1.38 CHANGES IN THE WORK**

- A. All Contract Change Requests shall be submitted to the Design Consultant complete with the substantiating documentation for review and approval. All Contract Change Requests shall be in a format in which all units of costs are so indicated, to include but not limited to the following: labor, material, equipment, OH&P, vendor and/or supplier, along with the required trade labor cost breakdown to perform this work. The Design Consultant shall determine whether, in its opinion, the request should be approved or disapproved, with or without additional time, and submit the Contract Change Request to the Program Manager for review. No Contract Change Request should be submitted to the Program Manager without the prior review and written recommendation from the Design Consultant. Not all

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changes shall constitute a time extension. Time extensions associated with changes in the Work shall be evaluated based upon criteria established in item 6G of The Special Condition of The Contract.

- B. Should the Design Consultant and the Program Manager concur as to the approval of a Contract Change Request, additional monies and/or time shall be added to the Contract through the execution of a Contract Change Order.
- C. If the Design Consultant and the Program Manager refuse to approve a Contract Change Request, no additional work shall be initiated, no additional time granted and no additional monies shall be added to the Contract.
- D. Should the Design Consultant and the Program Manager determine that work detailed in a Contract Change Request is included in the Contract Documents, and therefore should have been included in the Contractor's bid, the Contract Change Request shall be disapproved and no additional monies or time shall be added to the Contract. If it is deemed that said work is required as indicated by the Contract Documents, the Design Consultant and Program Manager reserve the right to require that the Contractor perform all said work in the Contract Change Request for the completion of the Work in accordance with the Contract Documents. The Contractor shall perform this work at no additional cost to the Owner and with no additional funds or time added to Contract.
- E. When work specified in a Contract Change Request entails the use of a subcontractor, the subcontractor must provide to the Contractor a detailed breakdown of costs. This shall include labor, materials, including units, and any other specific costs entailed for the completion of the work. The subcontractor shall also indicate its OH&P. This information shall be submitted in full for each subcontractor as part of the substantiating documentation required for each Contract Change Request. Bonding, insurance, administrative, supervisory, or other related overhead costs are considered a part of a subcontractor's overhead and shall not be included as additional costs.
- F. No money for general conditions will be considered where time only is added to the Contract by a Change Order.

**1.39 PROGRESS MEETINGS**

- A. Progress Meetings between Owner, Architect/Engineer, and Contractor (OAC) shall be scheduled by the Program Manager. The frequency of the meetings will be determined by the Program Manager in conjunction with the Design Consultant. The Contractor and/or representative, Design Consultant and/or his representative, the Program Manager and/or his representative, and all subcontractors whose work is in progress or who are within two weeks of initiating work, shall be present at these meetings.

**1.40 COMPLETION OF FINAL PUNCH LIST ITEMS**

- A. The Project Superintendent shall remain on site, on a full time basis, until such time as the punch list items have been verified as 100% complete, by the design consultant.

**END OF SECTION**

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**SECTION 01 1000  
SUMMARY OF THE WORK**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS AND GENERAL INFORMATION**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

**1.02 PROJECT/WORK IDENTIFICATION**

- A. General: Project name is "FORT PAYNE HIGH SCHOOL COMPETITION GYM AND CLASSROOM ADDITION, for Fort Payne City Schools, Fort Payne, Alabama", as shown on the Contract Documents prepared by Goodwyn Mills Cawood, LLC., dated\_\_\_\_\_.
- B. Contract Documents indicate the work of the Contract and related requirements and conditions that have an impact on the project.
- C. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions (if any), the Project Manual, Technical Specification Sections, Drawings, Addenda and modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and the Drawings, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.
- D. Abbreviated Written Summary: Briefly and without force and effect upon the contract documents, the Work of the Contract can be summarized as follows:
1. The Work includes construction of new building, and related work, as required to complete the facilities as indicated on the Drawings and in the Project Manual.

**1.03 CONTRACTOR USE OF PREMISES**

- A. General: During the entire construction period the Contractor shall have the exclusive use of the premises for construction operations, including full use of the site as shown on the Drawings.
1. Limitations of exclusive use of the site:
    - a. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to applicable rules and regulations affecting the work while engaged in project construction. See site plan for egress and ingress to site, or if not indicated, same shall be as designated by the Owner.
    - b. Keep existing public roads, driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials. Remove dirt, mud, debris, etc., from site, sidewalks, streets, and public right-of-way as it occurs.
    - c. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas agreed upon between the Owner, Architect, and Contractor at the Pre-Construction Conference. If additional storage is necessary, obtain and pay for such storage off site in a fully bonded and insured facility acceptable to the Owner, with all items stored clearly identified as being assigned to this project.
    - d. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running, or the ignition key in place.
    - e. The Owner, and their representatives, the Architect and their Consultants, as well as authorities having jurisdiction will require site accessibility for inspections, observations, and

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perhaps other purposes, related to the planned new construction. The Contractor shall assist in such accessibility, to at least the point of providing and maintaining reasonably accessible dry paths to work in progress.

- f. Construction operations shall not effect in any manner, the on-going operations of the Owner, immediately adjacent facilities, adjacent property owners or businesses, or others. Refer to Division 1 Section "Special Conditions" for additional information and requirements regarding coordination with Owner's activities.
  - 1) Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.
- g. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representatives named in the front of this Project Manual, Consultants employed, inspecting authorities with jurisdiction, and the Architect. In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
- h. Parking on-site, if any, shall be mutually agreed between the Owner, Architect, and Contractor at the Pre-Construction Conference.
- i. Smoking or other use of tobacco products shall not be permitted within the Owner's facilities or on roofs.
- j. The use or presence of alcohol and/or other debilitating substances shall not be permitted on the project site.
- k. Firearms and/or other weapons shall not be permitted on the project site.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**



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**SECTION 01 2100  
ALLOWANCES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cash allowances.
- B. Contingency allowance.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

**1.03 CASH ALLOWANCES**

**1.04 CONTINGENCY ALLOWANCE**

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

**1.05 DESCRIPTION OF REQUIREMENTS:**

- A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof (if any) will be issued by change order.
- B. Types of allowances scheduled herein for the work included the following:
  - 1. Unit cost allowances.
  - 2. Lump sum allowances.
- C. Selection and Purchase:
  - 1. At earliest feasible date after award of Contract, advise Architect/Engineer of scheduled date when final selection and purchase of each product or system described by each allowance must be accomplished in order to avoid delays in performance of the work.
  - 2. As requested by the Architect/Engineer, obtain and submit proposals for the work of each allowance for use in making final selections; include recommendations for selection which are relevant to the proper performance of the work.
  - 3. Purchase products and systems as specified, and as selected (in writing) by the Architect/Engineer.
  - 4. Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for change orders.
- D. Change Order Data: Include in each change order proposal both the quantities of products being purchased and unit costs, along with total amount of purchases to be made. Where requested, furnish survey-of-requirements data to substantiate quantities. Indicate applicable delivery charges, amounts of applicable trade discounts, and other relevant details as requested by the Architect.
  - 1. Each change order amount for allowances shall be based on the unit price difference between the actual purchase amount and the allowance, multiplied by the final measure or count of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.
  - 2. Include overhead and profit in the Contractor's Allowance.
  - 3. When requested, prepare explanations and documentation to substantiate the quantities, costs, and margins as claimed.

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- E. Change Order Mark-Up:
1. Except as otherwise indicated, comply with provisions of General Conditions. For each allowance, Contractor's claims for increased costs (for either purchase amount or Contractor's handling, labor, installation, overhead, and profit), because of a change in scope or nature of the allowance work as described in contract documents, must be submitted within 60 days of initial change order authorizing work to proceed on that allowance; otherwise, such claims will be rejected.
  2. Where it is not economically feasible to return unused material to the manufacturer/supplier for credit, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractor's responsibility.
- F. Time and Allowance Amounts:
1. Nothing in the Bid or Contract Documents shall be so construed or interpreted as to provide a Contract time extension, due to use or non-use of any Allowance amount.
  2. Nothing in the Bid or Contract Documents shall be so construed or interpreted as to allow unused Allowances or any portion thereof, nor any overhead and profit therefor to be retained by or paid to the Contractor.
    - a. Full amount of unused allowances shall be returned to the Owner.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 SCHEDULE OF LUMP SUM ALLOWANCES:**

- A. **Allowance No. 01 - AID TO CONSTRUCT COST (Cash Allowance):**
1. Allow a lump sum price of ONE HUNDRED THOUSAND DOLLARS (\$100,000.00) for the Aid to Construct Cost for on-site utilities.
  2. Include overhead and profit in Base Bid and not part of Allowance.
- B. **Allowance No. 02 - OWNER CONTINGENCY (Contingency Allowance)**
1. Allow a lump sum price of SIX HUNDRED THOUSAND DOLLARS (\$600,000.00) as an Owner Contingency Allowance.
  2. Include overhead and profit in Base Bid and not part of Allowance.
- C. **Allowance No. 03 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEM (Cash Allowance)**
1. Allow a lump sum price of SIXTY FIVE THOUSAND DOLLARS (\$65,000.00) for work associated with the purchase and installation of an Emergency Responder Radio Coverage System if found to be required after testing of the facility.
  2. See Section 28 7800 - Emergency Radio Responder Coverage System for requirements. Costs associated with testing to identify if the system is required shall be included in the Base Bid, and NOT as part of Allowance.
  3. Include overhead and profit in Base Bid and not part of Allowance.
- D. **Allowance No. 04 - SIGNAGE (Cash Allowance):**
1. Allow a lump sum price of ONE HUNDRED THOUSAND DOLLARS (\$100,000) for the signage, including design, purchase, all taxes, delivery to job site, installation, and all related costs, in accordance with Section 10 1400 - "Signage". Selections and copy will be furnished by Architect after bidding.
  2. Installation and installation materials costs shall be included in Allowance, and not as a part of Base Bid.
  3. Include overhead and profit in Base Bid and not part of Allowance.
  4. Building plaques are to be included in Base Bid, and not as part of Allowance.

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E. **Allowance No. 05 - POWER AND DATA (Cash Allowance):**

1. Allow a lump sum price of TWENTY FIVE THOUSAND DOLLARS (\$25,000) for work associated with power and data items not currently outlined in the scope of work.
2. Installation and installation materials costs shall be included in Allowance, and not as a part of Base Bid.
3. Include overhead and profit in Base Bid and not part of Allowance.

F. **Allowance No. 06 – PERMANENT CORES AND KEYS:**

1. Allow a lump sum of TWELVE THOUSAND DOLLARS (\$12,000.00) for purchase of permanent keyed cores and keys, as directed by owner. Cores to be used in lock cylinder housings supplied under Division 08 - Section 087100 Door Hardware. Provide each core with one operating key. New key system for schools shall include: 5 master keys per master key group created, 2 permanent control keys, 5 grand master keys, 5 great grand master keys, and 100 blanks.
2. Include installation of permanent cores and installation material costs in Base Bid, and not as part of Allowance.
3. Include overhead and profit in Base Bid, and not as part of Allowance.

G. **Allowance No. 07- ADDITIONAL SECURITY CAMERAS AND ACCESS CONTROLS**

- H. 1. Allow a lump sum of TEN THOUSAND DOLLARS (\$10,000.00) for purchase of additional camera's and access controls and any related items for a complete system.

- I. 2. Include shipping, delivery, taxes, and installation as part of the the Allowance.

J. **Allowance No. 08 – ADDITIONAL WALL HUNG SCOREBOARDS:**

1. Allow a lump sum of TWENTY THOUSAND DOLLARS (\$20,000.00) for purchase of wall hung scoreboards.
2. Include installation of permanent cores and installation material costs in Base Bid, and not as part of Allowance.
3. Include overhead and profit in Base Bid, and not as part of Allowance.

K. **Allowance No. 09 – INTERIOR WALL GRAPHICS:**

1. Allow a lump sum of SEVENTY - FIVE THOUSAND DOLLARS (\$75,000.00) for purchase of and installation of interior wall graphics
2. Include installation of permanent cores and installation material costs in Base Bid, and not as part of Allowance.
3. Include overhead and profit in Base Bid, and not as part of Allowance.

L. **Allowance No. 10 – MASONRY VENEER :**

1. Allow an allowance of \$650/1000 units for exterior masonry.
2. Include installation of permanent cores and installation material costs in Base Bid, and not as part of Allowance.
3. Include overhead and profit in Base Bid, and not as part of Allowance.

M. **Allowance No. 11 – OWENER ENTERTAINMENT LIGHTING SYSTEM :**

1. Allow an allowance of FIFTY THOUSAND DOLLARS (\$50,000.00) for the design, purchase, and installation of an entertainment lighting system for the gymnasium.
2. Do not include overhead and profit in Base Bid.

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**3.02 SCHEDULE OF UNIT PRICE ALLOWANCES:**

A. **Allowance No. 12 - UNDERCUT AND BACKFILL IN BUILDING CONTROL AREA**

1. In accordance with Section 01 2200 - Unit Prices and Section 31 2000 - Earth Moving, include an Allowance for the quantity identified. The Allowance value will be adjusted up or down based on

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- the actual quantity of the Work.
2. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
  3. Calculating Allowance No. 012:
    - a. Unit Price Item C: Undercut and Backfill in Building Control Area
    - b. Quantity of (225) Cubic Yards (CY)
    - c. Unit Price for each CY \$ \_\_\_\_\_.
    - d. Total Allowance No. 05 Value (b x c): \$ \_\_\_\_\_.
- B. Allowance No. 13 - UNDERCUT AND BACKFILL IN NON-BUILDING CONTROL AREA**
1. In accordance with Section 01 2200 - Unit Prices and Section 31 2000 - Earth Moving, include an Allowance for the quantity identified. The Allowance value will be adjusted up or down based on the actual quantity of the Work.
  2. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
  3. Calculating Allowance No. 13:
    - a. Unit Price Item D: Undercut and Backfill in Pavement Control Area
    - b. Quantity of (175) Cubic Yards (CY)
    - c. Unit Price for each CY \$ \_\_\_\_\_.
    - d. Total Allowance No. 06 Value (b x c): \$ \_\_\_\_\_.
- C. Allowance No. 14 - REMOVAL AND REPLACEMENT OF SIDEWALKS**
1. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
  2. Calculating Allowance No. 14:
    - a. Unit Price Item D: Undercut and Backfill in Pavement Control Area
    - b. Quantity of (365) Square Yards (SY)
    - c. Unit Price for each CY \$ \_\_\_\_\_.
    - d. Total Allowance No. 06 Value (b x c): \$ \_\_\_\_\_.
- D. Allowance No. 15 - REMOVAL AND REPLACEMENT OF FULL DEPTH**
1. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
  2. Calculating Allowance No. 14:
    - a. Unit Price Item D: Undercut and Backfill in Pavement Control Area
    - b. Quantity of (125) Square Yards (SY)
    - c. Unit Price for each CY \$ \_\_\_\_\_.
    - d. Total Allowance No. 06 Value (b x c): \$ \_\_\_\_\_.

END OF SECTION

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**SECTION 01 2900  
PAYMENT PROCEDURES**

**PART 1 - GENERAL**

**101 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**102 SUMMARY**

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

**103 DEFINITIONS**

- A. Schedule of Values: A statement acceptable to the Owner and Architect furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

**104 SCHEDULE OF VALUES**

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
    - c. Contractor's Construction Schedule.
  2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Contractor's name and address.
    - c. Date of submittal.
  2. Submit draft of Schedule of Values that will accompany Application for Payment.
  3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value.
      - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals,

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- punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
  5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
  7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
  9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
  10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

**105 APPLICATIONS FOR PAYMENT**

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by approving authority and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use Application and Certificate for Payment form stipulated in front-end documents as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Approving authority will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments.
  1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

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1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Products list.
  5. Schedule of unit prices.
  6. Submittals Schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.
  9. Copies of building permits.
  10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of preconstruction conference.
  13. Certificates of insurance and insurance policies.
  14. Performance and payment bonds.
  15. Data needed to acquire Owner's insurance.
  16. Initial settlement survey and damage report if required.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. Contractor's Affidavits of Payment of Debts and Claims, Release of Liens, and Consent of Surety to Final Payment.
  5. Evidence that claims have been settled.
  6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

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**PART 2 - PRODUCTS - NOT USED  
PART 3 - EXECUTION - NOT USED**

**END OF SECTION**



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**SECTION 01 3000  
ADMINISTRATIVE REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Electronic document submittal service.
- B. Requests For Information.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Requests for Interpretation (RFI) procedures.
- H. Submittal procedures (Including Submittal Numbering/Tracking Guide and form for Transmittal).
- I. Inspections.

**1.02 RELATED SECTIONS**

- A. Section 01 0150 - Special Conditions: Additional Administrative and Submittal Requirements.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

**1.03 REFERENCE STANDARDS**

- A. CSI/CSC Form 12.1A - Submittal Transmittal Current Edition.

**1.04 PROJECT COORDINATION (WITH CM)**

- A. Project Coordinator : Volkert Inc.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Engineer and Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
  - 1. Schedule of Submittals.
  - 2. Requests for Interpretation.
  - 3. Requests for substitution.
  - 4. Shop drawings, product data, and samples.
  - 5. Test and inspection reports.
  - 6. Design data.

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7. Manufacturer's instructions and field reports.
  8. Applications for payment and change order requests.
  9. Progress schedules.
  10. Coordination drawings.
  11. Correction Punch List and Final Correction Punch List for Substantial Completion.
  12. Closeout submittals.
  13. The Division of Construction Management Fee Proposal worksheet must be submitted with the Construction Contract.
  14. Scheduling of Inspections and submitting appropriate Contract Administration Fees to the Division of Construction Management.
  15. Final fee reconciliation and payment to the Division of Construction Management.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via e-Builder® service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
  1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
  2. Contractor and Architect are required to use this service.
  3. It is Contractor's responsibility to submit documents in allowable format.
  4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service, but will need to provide user information to the administrator to be added.
  5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, [www.adobe.com](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
  6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
  7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service: See Section 01 3150 Project Management Communications
- D. Training: One, one-hour, web-based training session can be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service. All training is available on-demand at e-Builder's main website.
- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner. Owner submitted warranty claims will be submitted through the service for one year following substantial completion.

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**3.02 REQUEST FOR INFORMATION**

- A. All Pre-Bid Questions, or Requests for Information must be submitted through a prequalified General Contractor via email to the Architect's Project Manager, with a copy to Kayla Thomas (kayla.thomas@gmcnetwork.com). Pre-Bid Questions will be accepted up to 48 hours prior to Bid Opening.
- B. After award of contract, submit Requests for Information (RFI's) to Architect's Project Manager through the service and provide a courtesy email to the Architect's administrative assistant, following the example form included at the end of this section.
- C. The e-Builder service will sequentially number the Requests for Information (RFI), and date accordingly.
- D. Explanations and interpretations will be issued via Addendum.
- E. After award of the Bid, a Request for Information (RFI), when submitted to the Architect, may result in an Architect's Supplemental Instruction (ASI), Request for Proposal (RFP), or Construction Change Directive (CCD) prior to the issuance of a Change Order.

**3.03 PRECONSTRUCTION CONFERENCES**

- A. Prior to commencing any work on the project, a pre-construction conference shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the project. Time and date of said conference shall be established by the Architect after award of construction contract.
- B. A Pre-Construction meeting shall not be conducted until both (1) the permit fee and (2) the signed Construction Contract have been received by the Alabama Division of Construction Management in accordance with the Code of Alabama 1975, 41-9-141 (a)(8) Alabama Division of Construction Management Administrative Rule 170X-8.
- C. Architect will schedule a meeting after Notice of Award.
- D. Attendance Required:
  - 1. Owner.
  - 2. Architect.
  - 3. Contractor.
  - 4. Division of Construction Management Representative.
- E. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing the parties to Contract, \_\_\_\_\_ and Architect.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
  - 8. Other items: To be announced.
- F. Similarly, prior to commencing any major portion of the Work of the project, preconstruction conferences shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the individual major portions of project. Time and date of said conferences shall be established by the General Contractor, and the Architect, Owner, and appropriate Consultants shall be advised in writing of times and dates, by the General Contractor.

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1. "Major portion" may be defined as work items for each Subcontractor working on site, and shall include in part, but not be limited to, earthwork, sitework, site utilities, concrete work, masonry, Division 5, roof framing and Division 6, insulation, roofing systems, finishes, specialties, casework, mechanical, plumbing, and electrical.
  - G. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

**3.04 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. The Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Architect , Owner , participants, and those affected by decisions made. Emails to Project Team are acceptable.
- D. Attendance Required:
  1. Contractor.
  2. Owner.
  3. Architect.
  4. Contractor's superintendent.
  5. Major subcontractors.
- E. Agenda:
  1. Review minutes of previous meetings.
  2. Review of work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems that impede, or will impede, planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Coordination of projected progress.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on progress schedule and coordination.
  13. Other business relating to work.

**3.05 REQUESTS FOR INTERPRETATION (RFI)**

- A. Definition: A request seeking one of the following:
  1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
  2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.

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- a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
  - b. Do not forward requests which solely require internal coordination between subcontractors.
  2. Prepare in a format and with content acceptable to Owner.
  3. Prepare using software provided by the Electronic Document Submittal Service.
  4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
  2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
    - a. Approval of submittals (use procedures specified elsewhere in this section).
    - b. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
    - c. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
  3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
  4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
    - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  2. Owner's, Architect's, and Contractor's names.
  3. Discrete and consecutive RFI number, and descriptive subject/title.
  4. Issue date, and requested reply date.
  5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
  6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
  7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  2. Note dates of when each request is made, and when a response is received.
  3. Highlight items requiring priority or expedited response.
  4. Highlight items for which a timely response has not been received to date.
  5. Identify and include improper or frivolous RFIs.

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- H. H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
    - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
  - I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
    - 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
    - 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
    - 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
    - 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### **3.06 SUBMITTAL SCHEDULE**

- A. Submit to Architect for review a schedule for submittals in tabular format.
  - 1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 – Construction Progress Schedule.
  - 2. Coordinate with Contractor's construction schedule and schedule of values.
  - 3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
  - 4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

### **3.07 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product data.
  - 2. Shop drawings.
  - 3. Samples for selection.
  - 4. Samples for verification.
- B. Submit to Architect , using the submittal numbering tracking system, for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

### **3.08 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect 's knowledge as contract administrator or for Owner. No action will be taken.

### **3.09 SUBMITTALS FOR PROJECT CLOSEOUT**

A. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

### **3.10 NUMBER OF COPIES OF SUBMITTALS**

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

C. Samples: Submit no less than 3-each of any sample or color chart which is required or otherwise requested, unless more are required in individual specification sections; one of which will be retained by the Architect .

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

D. Refer to Section 01 0150 - "Special Conditions" for additional information and requirements.

### **3.11 SUBMITTAL PROCEDURES**

A. General Requirements:

1. Use a single transmittal for related items.
2. Transmit using approved form.
  - a. Use form generated by e-Builder.
  - b. Use Form CSI/CSC Form 12.1A.
  - c. Use Contractor's form, subject to prior approval by Architect.
3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
  - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.

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6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    - a. Deliver submittals to Architect at business address.
    - b. Deliver submittals to Construction Manager at business address.
    - c. Send submittals in electronic format via email to Architect.
    - d. Upload submittals in electronic form to Electronic Document Submittal Service website.
  7. Schedule submittals to expedite the Project, and coordinate submission of related items.
    - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
    - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
  8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
  9. Provide space for Contractor and Architect review stamps.
  10. When revised for resubmission, identify all changes made since previous submission.
  11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
  12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
  13. Submittals not requested will not be recognized or processed.
  14. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
  2. Collect required information into a single submittal.
  3. Submit concurrently with related shop drawing submittal.
  4. Do not submit (Material) Safety Data Sheets for materials or products.
  5. Submit sustainable design reporting submittals under separate cover.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Do not reproduce Contract Documents to create shop drawings.
  3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Transmit each submittal with approved form.
- E. Transmit each submittal. Sequentially number each transmittal form according to the example shown on the sample Transmittal form provided at the end of this Section. Include the date, project number and name along with number of copies submitted.
- F. Deliver submittals to Architect at business address to the attention of the Contract Administration Coordinator.
- G. A Submittal Schedule must be submitted and approved by Architect prior to review of any and all submittals.

### **3.12 SCHEDULING OF INSPECTIONS**

- A. Contact the design professional by email of the date the project will be ready for an inspection.



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- B. The design professional will contact the Building Commission (DCM) Inspector to schedule the first available date for the inspection. Inspections must be requested 14 days in advance.
  - C. After DCM. Inspector notifies design professional of time of inspection, design professional will notify Contractor, Owner, and DCM. main office, copying DCM. Inspector.
  - D. Cancellations of any scheduled inspection must be received in writing by email no less than 48 hours prior to the scheduled inspection. The email shall be sent to the Contractor, DCM. Inspector, Owner, and DCM. main office. If an inspection is cancelled, it will be rescheduled subject to DCM. Inspector's availability.
  - E. If an inspection is cancelled less than 48 hours prior to the scheduled inspection, the re-inspection fee of \$1500 will be charged.

**3.13 MINIMUM REQUIREMENTS FOR REQUIRED INSPECTIONS**

- A. Use the following minimum requirements to help determine if a project is ready for required inspection:
- B. **PRE-CONSTRUCTION CONFERENCE.**
  - 1. Required Attendees: Contractor, Owner, Architect, Major Subcontractors.
  - 2. Inspection Requirements:
    - a. Signed construction contract.
    - b. Verification of payment of permit fee.
    - c. Contractor's Statement of Responsibility and Quality Assurance Plan (for storm shelter).
    - d. Fire Alarm Contractor's Certification (from State Fire Marshall).
    - e. ADEM permit, if more than 1 acre of land is disturbed.
- C. **PRE-CONSTRUCTION CONFERENCE FOR STORM SHELTER.**
  - 1. Required Attendees: Contractor, Owner, Architect, Structural Engineer, Major Subcontractors, Special Inspections Representative.
  - 2. Inspection Requirements:
    - a. DCM. Inspector must have already received Contractor's Statement of Responsibility and Quality Assurance Plan.
- D. **PRE-ROOFING CONFERENCE.**
  - 1. Required Attendees: Contractor, Owner, Architect, Roofing Subcontractor, Roofing Manufacturer's Representative.
  - 2. Inspection Requirements:
    - a. Roofing submittals must be approved by Architect prior to pre-roofing conference.
    - b. Roofing manufacturer must provide documentation that roof design and roofing materials meet code requirements for wind uplift and impact resistance.
    - c. Copy of sample roofing warranty.
- E. **ABOVE-CEILING INSPECTION.**
  - 1. Required Attendees: Contractor, Owner, Architect, MEP Engineers, Major Subcontractors.
  - 2. Inspection Requirements:
    - a. All work must be completed except for installation of ceiling tiles and/or hard ceilings.
    - b. Space must be conditioned.
    - c. Permanent power must be connected unless otherwise arranged with the DCM. Inspector.
    - d. Grease duct must be inspected and approved by the DCM Inspector prior to fire wrapping and Above-Ceiling Inspection.
- F. **LIFE SAFETY INSPECTIONS AND FINAL INSPECTIONS.**
  - 1. Required Attendees: Contractor, Owner, Architect, Engineers, Major Subcontractors, Local Fire Marshall.

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2. Inspection Requirements:
    - a. Fire alarm certification.
    - b. Kitchen hood fire suppression system certification.
    - c. General Contractor's 5-Year Roofing Warranty (DCM Form C-9).
    - d. Roofing manufacturer's guaranty.
    - e. Above ground and below ground sprinkler certifications.
    - f. Completed Certificate of Structural Engineers Observations for storm shelters.
    - g. Emergency and exit lighting tests.
    - h. Fire alarm must be monitored.
    - i. Elevator Inspection completed and Certificate of Operation provided by the State of Alabama Department of Labor.
    - j. Boiler/Vessels Inspection completed and Certificate of Operation provided by the State of Alabama Department of Labor.
    - k. Flush test for underground sprinkler lines (witnessed by local fire marshall, fire chief and/or DCM Inspector).
    - l. Flush/pressure test for new and/or existing fire hydrants.
    - m. Must have clear egress/access and emergency (for first responders) access to building.
    - n. Must have ADA access completed.
- G. YEAR-END INSPECTIONS.
1. Required Attendees: Contractor, Owner, Architect, Engineers and/or Major subcontractors may also be required to attend.
  2. Inspection Requirements:
    - a. Owner's list of documented warranty items that is tracked within the e-Builder® service.

**END OF SECTION**

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**SECTION 01 3150  
PROJECT MANAGEMENT COMMUNICATIONS**

**PART 1 GENERAL**

**101 RELATED DOCUMENTS**

- A. Attention is directed to the Contract, General Conditions, SPECIAL CONDITIONS and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.
- B. Refer to specification SECTION 01300 - SUBMITTALS for additional information.

**102 SUMMARY**

- A. Project Management Communications: The Contractor whose project shall use the Internet web based project management communications tool, Procore Construction Management software and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
  - 1. Project management communications is available through Procore in the form and manner required by the Owner.
  - 2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited.
- B. Training: Procore will provide a group training sessions scheduled by the Construction Manager, the cost of which is included in the initial user's fee. Users are required to attend the scheduled training sessions they are assigned to; requests for specific scheduled classes will be on a first come first served basis for available spaces. Companies may also obtain additional or group training from TeamBuilder at their own expense, please contact Procore for availability and cost.
- C. Support: Procore will provide on-going support through on-line help files.
- D. Project Archive: The archive shall be available to each team member at a nominal cost. The archive set will contain only documents that the firm has security access to during construction. All legal rights in any discovery process are retained.
- E. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.
- F. Purpose: The intent of using TeamBuilder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files.
- G. Requirements and Cost: The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the General Contractor shall use the Internet based project communications system and database hereafter referred to as Procore during construction of this project until twelve (12) months after the date of Substantial Completion or later as determined by the Owner.
  - 1. The General Contractor shall obtain user licenses within 15 days commencing the execution of the Owner Contractor Agreement.
- H. Authorized Users: Access to the web site will be by individuals who are licensed users.
  - 1. Individuals may use the User Application included in these specifications or may request the User Application.
  - 2. Authorized users will be contacted directly by the web site provider, TeamBuilder®, who will assign the temporary user password.

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- I. Administrative Users: Administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!** Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- J. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using Procore to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
    - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
    - b. The system shall make it easy to identify revised or superseded documents and their predecessors.
    - c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
  2. Document Security:
    - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties' communication except for Administrative Users. **DO NOT POST PRIVATE OR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**
  3. Document Integration:
    - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
  4. Reporting:
    - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
  5. Notifications and Distribution:
    - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
  6. Required Document Types:
    - a. RFI, Request for Information.
    - b. Submittals, including record numbering by drawing and specification section.
    - c. Transmittals, including record of documents and materials delivered in hard copy.
    - d. Meeting Minutes.
    - e. Application for Payments (Draft or Pencil).
    - f. Review Comments.
    - g. Daily Field Reports.
    - h. Construction Photographs.
    - i. Drawings.
    - j. Supplemental Sketches.
    - k. Schedules.
    - l. Specifications.
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- K. Record Keeping: All documents, except for paper documents that require original signatures and large format documents (greater than 8 ½ x 11 inches), shall be submitted by transmission in electronic form to the TeamBuilder web site by licensed users.
- a. The Owner and his representatives, the Program Manager and his representatives, the Architect and his consultants, the General Contractor, and his sub-contractors shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
  - b. The Owner and his representatives, the Program Manager and his representatives, the Architect and his consultants, General Contractor and his sub-contractors reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
  - c. The Owner and his representatives, the Program Manager and his representatives, the Architect and his consultants, the General Contractor and his sub-contractors reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
  - d. The following are some but not all of the paper documents which require original signature:
    - 1) Contract
    - 2) Change Orders
    - 3) Application & Certificates for Payment
    - 4) Request for Proposals
      - (a) Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Program Manager and his representatives, the Architect and his consultants, the General Contractor and his sub-contractors required to have a user license(s) shall be responsible for the following:

**PART 2 PRODUCTS (NOT APPLICABLE.)**

**PART 3 EXECUTION (NOT APPLICABLE.)**

**END OF SECTION**

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**SECTION 01 3216  
CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.

**102 REFERENCE STANDARDS**

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2015.

**103 SUBMITTALS**

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Submit updated schedule with each Application for Payment.
- D. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

**104 QUALITY ASSURANCE**

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

**105 SCHEDULE FORMAT**

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches.
- C. Scale and Spacing: To allow for notations and revisions.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**301 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a preliminary network diagram.

**302 CONTENT**

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.
- E. Include conferences and meetings in schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

- 
- G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
  - H. Indicate delivery dates for owner-furnished products.
  - I. Provide legend for symbols and abbreviations used.
  - J. Show total float for each construction activity.

**303 BAR CHARTS**

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

**304 NETWORK ANALYSIS**

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
  - 1. Preceding and following event numbers.
  - 2. Activity description.
  - 3. Estimated duration of activity, in maximum 15 day intervals.
  - 4. Earliest start date.
  - 5. Earliest finish date.
  - 6. Actual start date.
  - 7. Actual finish date.
  - 8. Latest start date.
  - 9. Latest finish date.
  - 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
  - 11. Monetary value of activity, keyed to Schedule of Values.
  - 12. Percentage of activity completed.
  - 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
  - 1. By preceding work item or event number from lowest to highest.
  - 2. By amount of float, then in order of early start.
  - 3. By responsibility in order of earliest possible start date.
  - 4. In order of latest allowable start dates.
  - 5. In order of latest allowable finish dates.
  - 6. Contractor's periodic payment request sorted by Schedule of Values listings.
  - 7. Listing of basic input data that generates the report.
  - 8. Listing of activities on the critical path.

**305 REVIEW AND EVALUATION OF SCHEDULE**

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.



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- C. After review, revise as necessary as result of review, and resubmit within 10 days.

**306 UPDATING SCHEDULE**

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

**307 DISTRIBUTION OF SCHEDULE**

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

**END OF SECTION**

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**SECTION 01 4000  
QUALITY REQUIREMENTS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

**102 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 4223 - Reference Standards and Definitions.
- C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

**103 DEFINITIONS**

- A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
  - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
  - 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

**104 REFERENCE STANDARDS**

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.
- G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
    - a. Full name.
    - b. Professional licensure information.
    - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Shop Drawings: For integrated exterior and interior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
1. Indicate manufacturer and model number of individual components.
  2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions
  3. Fire Protection: Sprinkler shop drawings shall include PE stamp of Professional Engineer licensed in the state in which the project is located.
- D. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- E. Schedule of Submittals.
- F. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- G. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
  2. Entity responsible for performing tests and inspections.
  3. Description of test and inspection.
  4. Identification of applicable standards.
  5. Identification of test and inspection methods.
  6. Number of tests and inspections required.
  7. Time schedule or time span for tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.
- H. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Compliance with Contract Documents.
    - k. When requested by Architect, provide interpretation of results.

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2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- I. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
    1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
    2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
  - J. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
  - K. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
    1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
  - L. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
    1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
    2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

**106 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
  1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

**107 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
  1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
  2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
  3. Laboratory: Authorized to operate in the State in which the Project is located.
  4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
  5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.
- D. Refer to Section 01 0150 - "Special Conditions" for additional information and requirements.

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**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**301 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

**302 MOCK-UPS**

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- E. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
  - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
  - 2. Make corrections as necessary until Architect's approval is issued.
- F. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- G. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
  - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.

- 
6. Build mock-up in the following 3 phases (minimum). Obtain approval of each phase from Architect before proceeding.
    - a. Substrate construction, and waterproofing.
    - b. Opening installation, and flashing.
    - c. Veneer. (Divide this into multiple phases of mock-up if there are multiple layers.)
  7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  8. Protect mock-ups from the elements with weather-resistant membrane.
  9. Demolish and remove mockups when directed unless otherwise indicated.
- I. Construct one each (masonry, stud, and concrete) as mock-up panels sized 8 feet high by 12 feet long at a corner condition, turning 2'-0". Each to receive One side of the mock-up is to include a typical glazed window (minimum 2' high for mock-up). The 2 foot side is to include a typical sealant-filled joint located 1'-4" from the corner. The mock-up is to be full thickness and contain exterior veneer, accessories, structural backup, wall openings, and wall insulation, with accompanying flashing and cavity drainage material, sealants, and waterproofing. Clean exposed faces of mock-up as required and specified. This panel will be for the purpose of approving the wall system and its components.
1. Sequence for mock-up construction.
    - a. Construct framing, substate, air barrier, flashings and window unit. Stop, and call for inspection by Architect prior to continuing construction.
    - b. Install insulation, masonry, cladding, coping cap, weeps and drainage, sealants, and joint fillers. Clean all exposed faces of mock-up. Stop, and call for inspection by Architect.
- J. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. See Drawings for any required Room Mockups.

### **303 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **304 TESTING AND INSPECTION**

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
  1. Test samples of mixes submitted by Contractor.
  2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  3. Perform specified sampling and testing of products in accordance with specified standards.
  4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
  6. Perform additional tests and inspections required by Architect.
  7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
  1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the Work.
  3. Agency may not assume any duties of Contractor.

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4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Price.
- F. Refer to Section 01 0150 - "Special Conditions" for additional information and requirements.

**305 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment, and \_\_\_\_\_ as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

**306 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.

**END OF SECTION**



10 September 2024

**STRUCTURAL ENGINEERING SECTIONS:**

01 4100 – SPECIAL INSPECTIONS  
01 4100 S– SCHEDULE OF SPECIAL INSPECTIONS  
03 3000 – CAST IN PLACE CONCRETE  
03 4100 – STRUCTURAL PRE CAST CONCRETE -PLANT CAST  
05 1200 – STRUCTURAL STEEL  
05 2200 - STEEL JOIST  
05 3100 STEEL DECK  
05 4100 COLD FORMED METAL FRAMING

SECTION 014100 – QA/ QC, STRUCTURAL TESTS, AND STRUCTURAL SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections as well as specific quality-assurance and -control requirements for individual construction activities as referenced in the Sections that specify those activities.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
  - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the construction document requirements.
  - 2. Requirements for contractor to provide quality-assurance and quality-control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.

1.3 DEFINITIONS

- A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official and the Structural Engineer of Record.
- B. Construction Documents: Written (including specifications), graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.
- C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.
- D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace

inspections and testing by the testing agency or special inspector.

- D. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.
- E. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- F. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- G. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
  - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
    - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
  - 2. Additional minimum qualifications of inspection and testing agencies and their personnel inspecting and testing concrete and concrete related work shall be as follows:
    - a. An independent agency, acceptable to the Structural Engineer of Record qualified according to ASTM C 1077.
    - b. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
    - c. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
  - 3. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

#### 1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.
- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.
- D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

#### 1.6 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.
  - 1. Special inspection reports and test results shall include, but not be limited to, the following:
    - a. Date of inspection.
    - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
    - c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.
      - 1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
    - d. Name and signature of special inspector and / or testing agency representative performing the work.
    - e. Additional information as required herein.
- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.
- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.
- D. Concrete Test Reports: Test results shall be reported in writing to Architect, Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain:
  - 1. Project identification name and number.
  - 2. Date and time of concrete placement.

3. Mix design number or identification.
  4. Design compressive strength at 28 days.
  5. Design Air Content.
  6. Design Slump.
  7. Location of concrete batch in Work.
  8. Time concrete was batched.
  9. Amount of water withheld at plant.
  10. Amount of water added at site.
  11. Temperature of mix at point of placement.
  12. Slump at point of placement
    - a. When use of a Type I or II plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C494 is used, slump shall be measured and report both before addition of the admixture and at the point of placement.
  13. Air content.
  14. Name of concrete testing and inspecting agency.
    - a. Name of Laboratory Technician and ACI Certification Number.
    - b. Name of Field Technician and ACI Certification Number.
  15. Compressive breaking strength.
  16. Type of break.
- E. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S RESPONSIBILITY

- A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.
- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.
- C. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
  - a. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.

- b. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
  - c. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.
- D. The contractor shall be responsible for costs of:
- a. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
  - b. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
  - c. Repair or replacement of work that does not meet the requirements of the construction documents.

### 3.2 STRUCTURAL OBSERVATIONS

- A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

### 3.3 TESTING AND INSPECTION SCHEDULE

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections, as listed elsewhere in the project documents, and as listed herein.
- B. Inspection of Fabricator's QC procedures
  - 1. Review the quality control procedures of the following fabricators for completeness and adequacy relative to the fabricator's scope of work: Joist Fabricator, Structural Steel Fabricator
- C. Soils Foundations, Periodic Inspection.
  - 1. Verify bearing capacities of soils beneath footings is in accordance with the approved project soils report and earthwork specifications.
  - 2. Verify assumed bearing capacities (As noted on the drawings, recommended by the geotechnical engineer, and specified in earthwork specifications.) and determine settlements of soils beneath footings and building pad.
  - 3. Verify site preparation prior to beginning fill placement. Verify fill material type, placement method, lift thickness, and compaction of fill material. Verify in-place density of compacted fill.
    - i. As recommended in approved soils report and specified in earthwork specifications.
- D. Concrete, Continuous Inspection
  - 1. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
    - i. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yds., but less than 25 cu. yd., plus one set for each additional

50 cu. yd. or fraction thereof.

- ii. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - i. Unit Weight is only required for lightweight concrete
6. Compression Test Specimens: ASTM C 31:
  - i. Cast and laboratory cure four standard cylinder specimens for each composite sample.
  - ii. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimens at 7 days, one set of two specimens at 28 days, and hold one in reserve for later testing as directed by the Structural Engineer of Record.
  - i. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
8. Inspect bolts to be installed prior to and during placement of concrete.
9. Inspect concrete placement to verify operations are in accordance with project requirements.
  - i. Verify correct mix is used.

E. Concrete, Periodic Inspection

1. Floor flatness:
  - i. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.
2. Inspect concrete formwork prior to concrete placement, except as noted. Verify that construction joints are properly keyed. Verify that slab recesses, if any, have been installed.
3. Inspect reinforcing steel prior to concrete placement, except as noted, for installation including

size, spacing and bar clearances. Verify that lap splices and embedment lengths are per the construction documents. Verify that dowels for work above are properly aligned and spaced to match other work.

4. Inspect all concrete curing operations and verify they are in accordance with project requirements.
5. Inspect the installation of anchors installed in hardened concrete.

F. Masonry, Continuous Inspection

1. Inspect grouting operations to ensure compliance with code and construction documents.
2. Inspect masonry cells and cleanouts prior to placement of grout. Inspect placement of all grout.
3. Inspect type size and location of anchors, including details of anchorage of masonry to structural members, frames or other construction.
4. Inspect preparation of grout specimens, mortar specimens and / or prisms.

G. Masonry, Periodic Inspection

1. At beginning of masonry construction:
  - i. Inspect proportions of site prepared mortar and grout.
  - ii. Inspect construction of mortar joints.
  - iii. Inspect reinforcement for correct size and spacing.
2. At beginning of masonry construction and every 1000 square feet of masonry thereafter
  - i. Inspect work for size and location of structural elements
  - ii. Inspect work for correct location and type of embeds and anchor bolts.
  - iii. Specified size, grade, and type of reinforcement.
3. Prior to grouting
  - i. Inspect masonry cells and cleanouts prior to placement of grout. Verify spaces are clear.
  - ii. Inspect any site prepared grout proportions.
  - iii. Inspect placement of reinforcement.
  - iv. Inspect construction of mortar joints
4. Inspect protection of masonry during cold weather and hot weather.
  - i. During periods with temperatures below 40 degrees or above 90 degrees.



5. Verify compliance with all required inspection provisions of the construction documents and approved submittals.

H. Steel Construction, Continuous Inspection

1. Inspect welding: Structural Steel:
  - i. Complete and partial penetration groove
    1. Perform Continuous Inspection during the Welding Operations to verify compliance with approved WPS.

I. Steel Construction, Periodic Inspection

1. Inspect high-strength bolts, nuts and washers:
  - i. Identify markings to conform to ASTM standards specified in the construction document.
  - ii. Inspect manufacturer's certificate of compliance.
2. Inspect high-strength bolting: Bearing-type connections.
3. Inspect and verify structural steel material:
  - i. Identification markings to conform to ASTM standards specified in the approved construction documents.
  - ii. Manufacturers' certified mill test reports.
4. Inspect and verify weld filler materials:
  - i. Identification markings to conform to AWS specification in the approved construction documents.
  - ii. Manufacturer's certificate of compliance required
5. Inspect welding: Structural Steel:
  - i. Single-pass fillet welds  $\leq 5/16$
  - ii. Floor and deck welds.
6. Inspect steel frame joint details for compliance with approved construction documents:
  - i. Details such as bracing and stiffening.
  - ii. Member locations.
  - iii. Application of joint details at each connection.

- J. Special Inspection for Wind Resistance, Periodic Inspection
  - 1. Roof Cladding and Roof Framing Connections.
  - 2. Wall Connections to Roof.
  - 3. Diaphragms connections to framing.
  
- K. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

**PART 4 - SCHEDULES AND FORMS (ATTACHED)**

---

Final Report of Special Inspections

---

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

*(Attach continuation sheets if required to complete the description of corrections.)*

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,  
Special Inspector

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
*Licensed Professional Seal*

---

Agent's Final Report

---

Project:

Agent:

Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

*(Attach continuation sheets if required to complete the description of corrections.)*

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,  
Agent of the Special Inspector

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

*Licensed Professional Seal or  
Certification*

Fabricator's Certificate of Compliance

---

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

Quality Assurance Plan – Storm Shelter

---

**Quality Assurance for Wind and Impact Requirements**

Basic Wind Speed (3 second gust)	250 MPH
Wind Exposure Category	C
Quality Assurance Plan Required (Y/N)	Y

Description of wind force resisting system and designated wind resisting components:

The shelter roof consists of composite steel beams with concrete slab that creates an impact resistant covering for the storm shelter and a diaphragm to transfer lateral forces to load bearing shear walls. These walls consist of reinforced concrete masonry walls filled with grout with a concrete beam at top of wall. The load path for wind forces is critical for the construction of the storm shelter. This load path consists of the connection of the composite steel beams and concrete slab to the reinforced top of wall concrete beam and the reinforced concrete masonry walls below, the lap splices and grouting of the reinforcing within these walls, the connection of these walls to the foundation (footings), and the construction of these footings.

Structural observations by the design professional shall be performed to conduct visual observation of the construction of the shelter for the items noted above. This observation is in addition to the inspections, to be performed by the Owner's testing agent and special inspector, outlined in the schedule of special inspections and in other areas of the contract drawings.

The reports for the testing, inspections, and structural observations shall be reported to the Design Professional in Responsible Charge (DPRC) of the Special Inspections as outlined on the Statement of Special Inspections. The DPRC shall distribute or cause to be distributed to the Owner, Architect, and Engineers of Record as well as the Building Official.

Each contractor, responsible for the construction of any portion of the storm shelter, shall thoroughly review the Quality Assurance Plan, Schedule of Special Inspections, and the Contract Drawings & Specifications and sign the attached Contractor's Statement of Responsibility.

Contractor's Statement of Responsibility

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Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan must submit a Statement of Responsibility.

Project:

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Statement of Responsibility:

**Contractor's Acknowledgment of Special Requirements**

I hereby acknowledge that I have received, read, and understand the Quality Assurance Plan and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Building Official.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**Contractor's Provisions for Quality Control**

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.





<b>SCHEDULE OF SPECIAL INSPECTIONS</b>				
<b>Item</b>	<b>Inspection / Test / Certification</b>	<b>C or P</b>	<b>Extent / Comments</b>	<b>Agent</b>
<b>1.00</b>	<b>Fabricators</b>			
1.01	Review the quality control procedures of the following fabricators for completeness and adequacy relative to the fabricator's scope of work: steel fabricator, lightgage truss fabricator, wood truss fabricator.	Periodic		OTA
1.02	The following fabricators, if registered and approved by the building official, may submit "Certificates of Compliance" at the completion of their scope of work that their fabricated items were constructed in accordance with the approved construction documents: steel fabricator, lightgage truss fabricator, wood truss fabricator.	Periodic		OTA
<b>2.00</b>	<b>Soils and Deep Foundations</b>			
2.01	Verify bearing capacities of soils beneath footings.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	OTA
2.02	Verify site preparation prior to beginning fill placement. Verify fill material type, placement method, lift thickness, and compaction of fill material. Verify in-place density of compacted fill.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	OTA
<b>3.00</b>	<b>Concrete Construction</b>			
3.01	Spread footings are excepted from the inspections listed below.			OTA
3.02	Continuous footings are excepted from the inspections listed below.			OTA
3.03	Slabs on grade are excepted from the inspections listed below.			OTA
3.04	Inspect reinforcing steel except as noted above for installation including size, spacing and bar clearances. Verify that lap splices and embedment lengths are per the construction documents. Verify that dowels for work above are properly aligned and spaced to match other work.	Periodic	Prior to each pour.	OTA; SDG for Shelter

SPECIAL INSPECTIONS SCHEDULE

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
3.05	Inspect bolts	Periodic		OTA
3.06	Verify each proposed concrete mix for the project.	Periodic	For each proposed mix.	OTA
3.07	Sample all concrete for strength tests and test concrete for slump, air content, temperature, and other tests.	Continuous	During placement operations. Reference concrete specifications for specific tests and frequencies.	OTA
3.08	Inspect concrete placement except as noted above.	Continuous		OTA
3.09	Inspect all concrete curing operations as noted in the extents column.	Periodic	Monitor during hot, cold and windy conditions. Reference concrete specifications.	OTA
3.10	Erection of precast concrete members.	Periodic	Inspect all connections.	OTA
3.11	Inspect Post installed anchors, expansion	Periodic		OTA
3.12	Inspect Post installed anchors, epoxy anchors	Continuous		OTA
<b>4.00</b>	<b>Masonry Construction</b>			
4.01	Masonry foundation walls are excluded from inspections listed below.			OTA
4.02	Inspect proportions of site prepared mortar and grout. Inspect construction of mortar joints. Inspect reinforcement for correct size and spacing. Inspect work for correct location and type of embeds and anchor bolts. Inspect work for size and location of structural elements.	Periodic	At beginning of masonry construction and every 1000 square feet of masonry thereafter.	OTA
4.04	Inspect masonry cells and cleanouts prior to placement of grout. Inspect grout proportions. Inspect placement of reinforcement.	Periodic	Prior to grouting of masonry.	OTA
4.05	Inspect grouting operations to ensure compliance with code and construction documents.	Continuous	During grouting.	OTA
4.06	Inspect proportions of site prepared mortar and grout. Inspect placement of masonry units and construction of mortar joints. Inspect reinforcement for correct size and spacing. Inspect work for correct size and location of structural elements.	Periodic	At beginning of masonry construction and every 1000 square feet of masonry thereafter.	OTA

SPECIAL INSPECTIONS SCHEDULE

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
4.07	Inspect masonry cells and cleanouts prior to placement of grout. Inspect placement of all grout.	Continuous	During grouting.	OTA
4.08	Inspect type size and location of anchors, including details of anchorage of masonry to structural members, frames or other construction.	Continuous	During installation of anchors.	OTA
4.09	Inspect protection of masonry during cold weather and hot weather.	Periodic	During periods with temperatures below 40 degrees or above 90 degrees.	OTA
4.10	Inspect preparation of grout specimens, mortar specimens and / or prisms.	Continuous	During preparation of all specimens.	OTA
4.11	Verify compliance with all required inspection provisions of the construction documents and approved submittals.	Periodic	As required for duration of project.	OTA
<b>5.00</b>	<b>Steel Construction</b>			
5.01	Inspect high-strength bolts, nuts and washers: a. Identify markings to conform to ASTM standards specified in the construction documents. b. Inspect manufacturer's certificate of compliance.	Periodic	Reference project specifications and ASTM material specifications; AISC 335, (Sect A3.4); AISC LRFD (Sect A3.3).	OTA
5.02	Inspect high-strength bolting: Bearing-type connections.	Periodic		OTA
5.03	Inspect high-strength bolting: Slip-critical connections.	Periodic or Continuous	Continuous monitoring required for pretensioning using calibrated wrench method or turn-of-nut method without matchmarking.	OTA
5.04	Inspect and verify structural steel material: a. Identification markings to conform to ASTM standards specified in the approved construction documents. b. Manufacturers' certified mill test reports.	Periodic	Confirm that materials meet applicable ASTM specifications noted in construction documents.	OTA
5.05	Inspect and verify weld filler materials: a. Identification markings to conform to AWS specification in the approved construction documents. b. Manufacturer's certificate of compliance required.	Periodic	Confirm that materials meet applicable ASTM specifications noted in construction documents.	OTA
5.06	Inspect welding: Structural Steel: 1) Complete and partial penetration groove 2) Multipass fillet welds. 3) Single-pass fillet welds > 5/16 "	Continuous	Per specifications and AWS D1.1	OTA
5.07	Inspect welding: Structural Steel: 1) Single-pass fillet welds ≤ 5/16 " 2) Floor and deck welds.	Periodic	Per specifications and AWS D1.1	OTA

SPECIAL INSPECTIONS SCHEDULE

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
5.08	6. Inspect steel frame joint details for compliance with approved construction documents: a. Details such as bracing and stiffening. b. Member locations. c. Application of joint details at each connection.	Periodic	Inspect complete frame.	OTA
5.09	Steel deck attachment, roof	Periodic		OTA
<b>6.00</b>	<b>Special Inspections for Wind Resistance</b>			
6.01	Roof Cladding and Roof Framing Connections	Periodic		OTA
6.02	Wall Connections to Roof and Floor Diaphragms and Framing	Periodic		OTA
6.03	Roof and Floor Diaphragm Systems, including Collectors, Drag Struts, and Boundary Elements.	Periodic		OTA
6.04	Vertical Windforce-Resisting Systems, including Braced Frames, Moment Frames, and Shearwalls	Periodic		OTA
6.05	Windforce-Resisting System Connections to the Foundation.	Periodic		OTA
6.06	Fabrication and installation of components and assemblies required to meet the impact-resistance requirements of Section 1609.1.4.	Periodic		OTA
<b>7.00</b>	<b>Special Inspections for Seismic Resistance</b>			
7.01	Inspect structural welding in accordance with AISC 341.	Continuous	Exceptions: 1. Single-pass fillet welds not exceeding 5/16 inch in size. 2. Floor and roof deck welding.	OTA
7.02	Inspect nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system including drag-struts, braces and hold-downs.	Periodic		OTA

SPECIAL INSPECTIONS SCHEDULE

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
7.03	Inspect welding operations of cold-formed steel framing elements of the seismic-force-resisting system.	Periodic		OTA
7.04	Inspect screw attachment, bolting, anchoring and other fastening of cold-formed steel framing components within the seismic-force-resisting system.	Periodic		OTA
7.05	Certificates of compliance used in masonry construction		Prior to construction.	OTA
7.06	Verify masonry <i>f<sub>m</sub></i> .		Prior to construction.	OTA
7.07	Test masonry <i>f<sub>m</sub></i> .	Periodic	Test for each 5000 sf of masonry.	OTA
7.08	Verification of proportions of materials in mortar and grout as delivered to the site	Periodic		OTA
7.09	Review certified mill test reports of all concrete reinforcing.			OTA
7.10	Submit certificate of compliance for designated seismic system components			OTA
<b>8.00</b>	<b>Cold Formed Steel Framing Construction</b>			
8.01	Inspect exterior wall infill including installed studs' sizes and attachments.	Periodic		OTA
8.02	Inspect roof trusses assembly/framing and attachments.	Periodic		OTA
8.03	Verify size and gage of load bearing studs.	Periodic		OTA
8.04	Verify load bearing framing spacing, configuration and attachments.	Periodic		OTA
8.05	Verify load bearing bracing and blocking	Periodic		OTA
8.06	Proper seating of studs in track.	Periodic		OTA
8.07	Stud header size, gauge, and construction per structural drawings for load bearing walls.	Periodic		OTA
8.08	Screw attachments, bolting, anchoring, and other fastening of components per structural drawings.	Periodic		OTA
8.09	Welding of elements per structural drawings.	Periodic		OTA
8.10	Where a cold-formed steel truss clear span is 60 feet or greater, verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.	Periodic		OTA
<b>INSPECTION AGENTS</b>				
#	Firm, Address, Telephone			
OTA	Owner's Testing Agent			
SDG	SDG -- 300 Chase Park South, Suite 125, Hoover, AL 35244 -- (205) 824 -5200			

SPECIAL INSPECTIONS SCHEDULE

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
<p><i>Note: The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Inspection Agent(s) may be subject to the approval of the Building Official.</i></p> <p>Is the Schedule of Special Inspection Services part of a Quality Assurance Plan as defined in Sections 1705 or 1706 of the Building Code? _____</p>				

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Project Site is shown on the Drawings, and may or may not be identical with the description of the land on which the Project is to be built.

1. If areas available are not indicated, they will be as mutually agreed by Owner and Contractor at Preconstruction Conference and as modified during construction.
- N. Testing Laboratories: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- O. OFOI: Owner Furnished, Owner Installed.
1. Equipment indicated on the drawings with the (OFOI) symbol designates the Owner will supply and deliver to the project site any equipment and finish items specified in these specifications and the Owner install the equipment and finish items in place ready for intended use.
  2. The Owner shall furnish all standard integral parts of the equipment and finishes, and tailgate-deliver items to project site.
  3. Owner shall receive items at site and give written receipt for items at time of delivery, noting visible defects or omissions. If such declaration is not given, the Owner shall assume responsibility for such defects and omissions. Contractor shall be responsible for cooperating with the Owner who shall provide unloading, handling and proper storage of equipment prior to installation at the site. The Owner and the Contractor will coordinate deliveries of equipment and finish items to coincide with construction schedule to minimize storage of equipment before installation.
  4. Owner shall uncrate, assemble, set items in place, and install items in accordance with manufacturer's instructions.
  5. Contractor shall provide utility rough-in for equipment items where required regardless of equipment responsibility designation unless specifically noted otherwise.
  6. Contractor shall be responsible for verification of utility requirements for approved equipment items. Upon request, the Owner shall make available dimensions and power characteristics of the Owner-furnished items.
- P. OFCI: Owner Furnished, Contractor Installed.

**103 SPECIFICATION FORMAT AND CONTENT EXPLANATION:**

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute’s 50-Division format and MASTERFORMAT numbering system.
- B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
  1. Abbreviated Language:
    - a. Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.
  2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

**104 DRAWING SYMBOLS:**

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by “Architectural Graphic Standards”, published by John Wiley & Sons, Inc., seventh edition.

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**SECTION 01 4216  
DEFINITIONS**

**PART 1 GENERAL**

**101 SUMMARY**

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

**102 DEFINITIONS**

- A. Indicated: The term “indicated” refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as “shown,” “noted,” “scheduled,” and “specified” are used, it is to help the reader locate the reference; no limitation on location is intended.
- B. Directed: Terms such as “directed,” “requested,” “authorized,” “selected,” “approved,” “required,” and “permitted” mean “directed by the Architect,” “requested by the Architect,” and similar phrases.
- C. Approve: The term “approved,” where used in conjunction with the Architect’s action on the Contractor’s submittals, applications, and requests, is limited to the Architect’s duties and responsibilities as stated in the Conditions of the Contract.
- D. Regulation: The term “Regulations” includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- E. Furnish: To supply, deliver, unload, and inspect for damage.
- F. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- G. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- H. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- I. Provide: To furnish and install.
- J. Supply: Same as Furnish.
- K. Installer:
  - 1. An “Installer” is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 2. The term “experienced,” when used with the term “Installer,” means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
- L. Trades: Use of titles such as “carpentry” is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
- M. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the



- 
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

**1.05**

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 01 4219  
REFERENCE STANDARDS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Requirements relating to referenced standards.
- B. Reference standards full title and edition date.

**102 RELATED REQUIREMENTS**

**103 QUALITY ASSURANCE**

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with the reference standard of date of issue specified in this section, except where a specific date is established by applicable code.
- C. Obtain copies of standards when required by Contract Documents.
- D. Where required elsewhere in the contract documents, maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
  - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

**PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS**

**201 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.**

**202 ASTM E SERIES -- ASTM INTERNATIONAL**

- A. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).
- B. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).
- C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- D. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

**203 CISCA -- CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION**

**204 ICC -- INTERNATIONAL CODE COUNCIL, INC.**

- A. ICC (IBC)-2018 - International Building Code; 2018.

**END OF SECTION**

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**SECTION 01 4533  
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Code-required special inspections.
- B. Testing services incidental to special inspections.
- C. Submittals.

**1.02 RELATED REQUIREMENTS**

**1.03 DEFINITIONS**

- A. Code or Building Code: ICC (IBC)-2018, Edition of the International Building Code and specifically, Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. Special Inspection:
  - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
  - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

**1.04 REFERENCE STANDARDS**

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2022.
- C. AISC 360 - Specification for Structural Steel Buildings; 2022.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- E. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2023.
- F. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.
- G. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
- H. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2021.
- I. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.
- J. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).
- K. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).
- L. ICC (IBC)-2018 - International Building Code; 2018.

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**105 SUBMITTALS**

- A. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
  - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- B. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures. Include documentation of AHJ approval.
- C. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of special inspection.
    - h. Date of special inspection.
    - i. Results of special inspection.
    - j. Compliance with Contract Documents.
  - 2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.
- D. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test or inspection.
    - h. Date of test or inspection.
    - i. Results of test or inspection.
    - j. Compliance with Contract Documents.

**106 SPECIAL INSPECTION AGENCY**

- A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.

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- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

**1.07 TESTING AND INSPECTION AGENCIES**

- A. Owner or Architect may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL**

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
  - 1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  - 2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

**3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION**

- A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC)-2018.
- B. Steel Frame Joint Details: Verify compliance with approved Contract Documents.
  - 1. Details, bracing and stiffening; periodic.
  - 2. Application of joint details at each connection; periodic.

**3.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION**

- A. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M, and ACI CODE-318, Sections 5.6 and 5.8 and record the following, continuous:
  - 1. Slump.
  - 2. Air content.
  - 3. Temperature of concrete.

**3.04 SPECIAL INSPECTIONS FOR MASONRY CONSTRUCTION**

- A. Masonry Structures Subject to Special Inspection:
  - 1. Empirically designed masonry, glass unit masonry and masonry veneer in structures designated as "essential facilities".
  - 2. Engineered masonry in structures classified as "low hazard..." and "substantial hazard to human life in the event of failure".
- B. Verify each item below complies with approved Contract Documents and the applicable articles of TMS 402/602.
  - 1. Inspections and Approvals:
    - a. Verify compliance with the required inspection provisions of the approved Contract Documents; periodic.
    - b. Verify approval of submittals required by Contract Documents; periodic.
  - 2. Compressive Strength of Masonry: Verify compressive strength of masonry units prior to start of construction unless specifically exempted by code; periodic.

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3. Slump Flow and Visual Stability Index (VSI): Verify compliance as self consolidating grout arrives on site; continuous.
  4. Joints and Accessories: When masonry construction begins, verify:
    - a. Proportions of site prepared mortar; periodic.
    - b. Construction of mortar joints; periodic.
    - c. Location of reinforcement, connectors, prestressing tendons, anchorages, etc; periodic.
  5. Structural Elements, Joints, Anchors, Protection: During masonry construction, verify:
    - a. Size and location of structural elements; periodic.
    - b. Type, size and location of anchors, including anchorage of masonry to structural members, frames or other construction; periodic.
    - c. Size, grade and type of reinforcement, anchor bolts and prestressing tendons and anchorages; periodic.
    - d. Welding of reinforcing bars; continuous.
  6. Grouting Preparation: Prior to grouting, verify:
    - a. Grout space is clean; periodic.
    - b. Correct placement of reinforcing, connectors, prestressing tendons and anchorages; periodic.
    - c. Correctly proportioned site prepared grouts and prestressing grout for bonded tendons; periodic.
    - d. Correctly constructed mortar joints; periodic.
  7. Preparation of Grout Specimens, Mortar Specimens and Prisms: Observe preparation of specimens; periodic.

**305 SPECIAL INSPECTIONS FOR SOILS**

- A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
  1. Design bearing capacity of material below shallow foundations; periodic.
  2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
  3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
  4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.
- B. Testing: Classify and test excavated material; periodic.

**306 SPECIAL INSPECTIONS FOR DRIVEN DEEP FOUNDATIONS**

- A. Materials, Equipment and Final Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
  1. Material types, sizes and lengths; continuous.
  2. Capacities of test elements and additional load tests as required; continuous.
  3. Placement locations and plumbness; continuous.
  4. Type and size of hammer; continuous.
- B. Installation: Observe driving operations and maintain complete and accurate records for each element; continuous.
  1. Record number of blows per foot of penetration.
  2. Determine penetration required to achieve design capacity.
  3. Record tip and butt elevations.
  4. Document any damage to foundation element.
- C. Steel Components of Driven Deep Foundations: Perform additional inspections as required by the Special Inspections for Steel Construction article of this section.



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- D. Concrete and Concrete Filled Components of Driven Deep Foundations: Perform additional inspections as required by the Special Inspections for Concrete Construction article of this section.

**3.07 SPECIAL INSPECTIONS FOR CAST-IN-PLACE DEEP FOUNDATIONS**

- A. Materials, Equipment and Final Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
1. Element length; continuous.
  2. Element diameters and bell diameters; continuous.
  3. Embedment into bedrock; continuous.
  4. End bearing strata capacity; continuous.
  5. Placement locations and plumbness; continuous.
  6. Type and size of hammer; continuous.
- B. Drilling Operations: Observe and maintain complete and accurate records for each element; continuous.
- C. Material Volume: Record concrete and grout volumes.
- D. Concrete Elements Associated with Cast-in-Place Deep Foundations: Perform additional inspections as required by the Special Inspections for Concrete Construction article of this section.

**3.08 SPECIAL INSPECTIONS FOR HELICAL PILE FOUNDATIONS**

- A. Materials, Equipment and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
1. Type and capacity of installation equipment used; continuous.
  2. Pile dimensions; continuous.
  3. Tip elevation; continuous.
  4. Final depth; continuous.
  5. Final installation torque; continuous.
  6. Other installation data requested in writing by Architect; continuous.

**3.09 SPECIAL INSPECTIONS FOR VERTICAL MASONRY FOUNDATION ELEMENTS**

- A. Vertical Masonry Foundation Elements are subject to the same special inspection requirements listed in the "Special Inspections for Masonry Construction" Article of this section.

**3.10 SPECIAL INSPECTIONS FOR SPRAYED FIRE RESISTANT MATERIALS**

- A. Sprayed Fire Resistant Materials, General:
1. Verify compliance of sprayed-fire resistant materials with specific fire-rated assemblies indicated in approved Contract Documents, and with applicable requirements of the building code.
  2. Perform special inspections after rough installation of electrical, mechanical, plumbing, automatic fire sprinkler and suspension systems for ceilings.
- B. Physical and visual tests: Verify compliance with fire resistance rating.
1. Condition of substrates; periodic.
  2. Thickness of sprayed fire resistant material; periodic.
  3. Density of sprayed fire resistant material in pounds per cubic foot; periodic.
  4. Bond strength (adhesion and cohesion); periodic.
  5. Condition of finished application; periodic.
- C. Structural member surface conditions:
1. Inspect structural member surfaces before application of sprayed fire resistant materials; periodic.
  2. Verify preparation of structural member surfaces complies with approved Contract Documents and manufacturer's written instructions; periodic.

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- D. Application:
    - 1. Ensure minimum ambient temperature before and after application complies with the manufacturer's written instructions; periodic.
    - 2. Verify area where sprayed fire resistant material is applied is ventilated as required by the manufacturer's written instructions during and after application; periodic.
  - E. Thickness: Verify that no more than 10 percent of thickness measurements taken from sprayed fire resistant material are less than thickness required by fire resistance design in approved Contract Documents. In no case shall the thickness of the sprayed fire resistant material be less than the minimum below.
    - 1. Minimum Allowable Thickness: Tested according to ASTM E605/E605M, periodic.
      - a. Design thickness 1 inch or greater: Design thickness minus 1/4 inch.
      - b. Design thickness greater than 1 inch: Design thickness minus 25 percent.
  - F. Density: Verify density of sprayed fire resistant material is no less than density required by the fire resistance design in the approved Contract Documents.
  - G. Bond Strength: Verify adhesive and cohesive bond strength of sprayed fire resistant materials is no less than 150 pounds per square foot when in-place samples of the cured material are tested according to ASTM E736/E736M and as described below.

**3.11 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE**

- A. Structural Steel: Comply with the quality assurance plan requirements of AISC 341.
- B. Structural Wood:
  - 1. Field gluing; continuous.
  - 2. Nailing, bolting, anchoring and other fastening of components within the seismic force-resisting system; periodic.
- C. Cold Formed Steel Light Frame Construction:
  - 1. Field welding; periodic.
  - 2. Screw attachment, bolting, anchoring and other fastening of components within the main seismic force-resisting system; periodic.
- D. Designated Seismic System Verification: Verify label, anchorage or mounting complies with certificate of compliance provided by manufacturer or fabricator.
- E. Structural Testing for Seismic Resistance:
  - 1. Concrete reinforcement: Comply with ACI CODE-318, Section 21.1.5.2.
    - a. Materials Obtain mill certificates demonstrating compliance with ASTM A615/A615M; periodic.
    - b. Welding: Perform chemical tests complying with ACI CODE-318, Section 3.5.2 to determine weldability; periodic.
  - 2. Structural Steel: Comply with the quality assurance requirements of AISC 341.
- F. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

**3.12 SPECIAL INSPECTIONS FOR WIND RESISTANCE**

**3.13 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES**

- A. Special Inspection Agency shall:
  - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

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2. Perform specified sampling and testing of products in accordance with specified reference standards.
  3. Ascertain compliance of materials and products with requirements of Contract Documents.
  4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
  5. Perform additional tests and inspections required by Architect.
  6. Submit reports of all tests or inspections specified.
- B. Limits on Special Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the work.
- C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

**3.14 TESTING AGENCY DUTIES AND RESPONSIBILITIES**

- A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  2. Perform specified sampling and testing of products in accordance with specified standards.
  3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
  5. Perform additional tests and inspections required by Architect.
  6. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the work.
- C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

**3.15 CONTRACTOR DUTIES AND RESPONSIBILITIES**

- A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
  2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
  3. Provide incidental labor and facilities:
    - a. To provide access to work to be tested or inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
    - c. To facilitate tests or inspections.

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- d. To provide storage and curing of test samples.
  - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
  - 5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  - B. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
  - C. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

**END OF SECTION**

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**SECTION 01 5000  
TEMPORARY FACILITIES AND CONTROLS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Field offices.

**102 RELATED REQUIREMENTS**

- A. Section 01 5813 - Temporary Project Signage.

**103 TEMPORARY UTILITIES**

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may not be used.

**104 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Telephone Lines: One line, minimum; one handset per line.
  - 2. Internet Connections: Minimum of one; DSL modem or faster.
  - 3. Cellular phones are an acceptable substitute for items 1 & 2, provided they fulfill requirements of same.

**105 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

**106 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**107 FENCING**

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Provide gates as required by Contractor and/or authorities having jurisdiction, with all related safety and

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warning signs.

1. Fencing shall be at least 11-1/2 gauge galvanized chain-link fencing, securely held in place by posts, braces, rails, etc.
- B. Fence shall be approximately 30-feet from perimeter of buildings, unless Drawings indicate otherwise. Extent of fencing shall be as required to maintain a secure worksite.
- C. All such fencing shall be removed upon completion of the work of this project, removed from the site, and any post holes filled and compacted same as adjacent grade or paving, by the Contractor.
- D. Responsibility and maintenance of such fencing and areas within such fencing shall be held by this Contractor beginning at the date of its erection and until its removal, close to the date of project completion.

**1.08 EXTERIOR ENCLOSURES**

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

**1.09 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

**1.10 VEHICULAR ACCESS AND PARKING**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

**1.11 WASTE REMOVAL**

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

**1.12 PROJECT SIGNS - SEE SECTION 01 5813**

**1.13 FIELD OFFICES**

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

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- B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.
  - C. Locate offices a minimum distance of 30 feet from existing and new structures.

**1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 01 5813  
TEMPORARY PROJECT SIGNAGE**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Project identification sign.
- B. Project informational signs.

**102 RELATED REQUIREMENTS**

- A. Section 01 0150 - Special Conditions: Supplemental sign information.
- B. Project Sign Detail: Included at the end of this Section.

**103 REFERENCE STANDARDS**

- A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

**104 QUALITY ASSURANCE**

- A. Design sign and structure to withstand 50 miles/hr wind velocity.
- B. Sign Painter: Experienced as a professional sign painter for minimum three years.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

**PART 2 - PRODUCTS**

**201 SIGN MATERIALS**

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
  - 1. See Project Sign Detail for Options.
- C. Rough Hardware: Galvanized.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, colors as selected.
  - 1. See Project Sign Detail for Options.

**202 PROJECT IDENTIFICATION SIGN**

- A. Painted sign of construction, design, and content shown on Project Sign Detail, and described below.
  - 1. Refer to Detail of Project Sign, following this Section.
- B. Content:
  - 1. Project number, title, logo and name of Owner as indicated on Contract Documents.
  - 2. Names and titles of authorities.
  - 3. Names and titles of Architect.
  - 4. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

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**203 PROJECT INFORMATIONAL SIGNS**

- A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.
- B. Provide at each field office, storage shed , and directional signs to direct traffic into and within site. Relocate as Work progress requires.
- C. Provide municipal traffic agency directional traffic signs to and within site.

**PART 3 - EXECUTION**

**301 INSTALLATION**

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at location of high public visibility adjacent to main entrance to site.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces of sign, supports, and framing.

**302 MAINTENANCE**

- A. Maintain signs and supports clean, repair deterioration and damage.

**303 REMOVAL**

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

**END OF SECTION**

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**SECTION 01 6000  
PRODUCT REQUIREMENTS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

**102 RELATED REQUIREMENTS**

- A. Instructions To Bidders, and Supplementary Instructions To Bidders: Additional information and requirements concerning Substitutions.
- B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 4000 - Quality Requirements: Product quality monitoring.

**103 SUBMITTALS**

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 15 days after date of Agreement.
  - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

**PART 2 - PRODUCTS**

**201 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

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- D. Overall Project Requirement: Use reused products for at least 5 percent of all products used on project.

**202 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
1. Made of wood from newly cut old growth timber.
- C. Where other criteria are met, Contractor shall give preference to products that:
1. Are extracted, harvested, and/or manufactured closer to the location of the project.
  2. Have longer documented life span under normal use.
  3. Result in less construction waste. See Section 01 7419
  4. Are made of vegetable materials that are rapidly renewable.

**203 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

**204 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

**PART 3 - EXECUTION**

**301 SUBSTITUTION LIMITATIONS**

- A. See Section 01 2500 - Substitution Procedures.
- B. Acceptance of suppliers, manufacturers, and/or products shall be limited to those named, unless others are properly submitted during bidding in accordance with substitution procedures, and subsequently accepted.
- C. Instructions to Bidders specifies time restrictions and procedures for submitting requests for substitutions during the bidding period. These time restrictions and procedures are superceded by any modifications found in Supplementary Instructions to Bidders (or Additions to Instructions to Bidders).
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
1. Submittals during construction other than those pre-qualified or pre-accepted will not be reviewed, but instead returned for re-submittal, without exception.
- E. Substitution Submittal Procedure. A proper pre-bid submittal for "pre-qualified" or "pre-accepted" consideration and review, shall be one which includes at least the following:
1. Submit request for substitution for consideration. Limit each request to one proposed substitution.
    - a. Use Substitution Request form attached at end of this Section.
  2. Submit with cover letter which outlines the purpose of the submittal, Architect's specifications which apply, and each variation from the original specification.
  3. Submit product data (all current and relevant manufacturer's published data), certified test results attesting to the proposed product equivalence, and additional information as required so that a

- review can be quickly made by comparing the submittal item for item to the original specification. Include samples and other data as requested for the original item. Burden of proof is on proposer.
4. Substitution requests shall be submitted through a qualified General Contractor bidding the project.

- F. After receipt of bids and execution of the Construction Contract, the Owner and the Architect will consider substitutions only under the following conditions:
1. Unavailability of materials if beyond the control of the Contractor and submitted proof that firm orders for the material were placed within ten (10) days after approval of the Subcontractors and Material Suppliers Lists.
  2. Other unavailability will be considered only as being due to strikes, lockouts, bankruptcy, or discontinuance of manufacture.
  3. Any approved substitutions shall be incorporated into the Contract by Change Order.

### **302 OWNER-SUPPLIED PRODUCTS**

- A. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
  2. Arrange and pay for product delivery to site.
  3. On delivery, inspect products jointly with Contractor.
  4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
  2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  3. Handle, store, install and finish products.
  4. Repair or replace items damaged after receipt.

### **303 TRANSPORTATION AND HANDLING**

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### **304 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.

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- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
  - E. For exterior storage of fabricated products, place on sloped supports above ground.
  - F. Provide off-site storage and protection when site does not permit on-site storage or protection.
  - G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
  - H. Comply with manufacturer's warranty conditions, if any.
  - I. Do not store products directly on the ground.
  - J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
  - K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
  - L. Prevent contact with material that may cause corrosion, discoloration, or staining.
  - M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
  - N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION**

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**SECTION 01 7000  
EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- G. General requirements for maintenance service.

**102 RELATED REQUIREMENTS**

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- D. Section 02 4100 - Demolition: Selective demolition of building elements for alterations purposes.
- E. Individual Product Specification Sections:
  - 1. Advance notification to other sections of openings required in work of those sections.
  - 2. Limitations on cutting structural members.

**103 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
  - 2. Identify demolition firm and submit qualifications.
  - 3. Include a summary of safety procedures.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.
  - 6. Include in request:
    - a. Identification of Project.
    - b. Location and description of affected work.

- c. Necessity for cutting or alteration.
- d. Description of proposed work and products to be used.
- e. Alternatives to cutting and patching.
- f. Effect on work of Owner or separate Contractor.
- g. Written permission of affected separate Contractor.
- h. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

**105 QUALIFICATIONS**

- A. For survey work, employ a Professional Land Surveyor licensed in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

**106 PROJECT CONDITIONS**

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
  - 1. Minimize amount of bare soil exposed at one time.
  - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
  - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
  - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

**107 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for



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accommodating items installed later.

1. Contractor shall schedule ordering of products, taking lead-times into account, and shall be responsible for any cost associated with expediting delivery of specified items in order to keep project on schedule.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner-occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## **PART 2 - PRODUCTS**

### **201 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

## **PART 3 - EXECUTION**

### **301 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
  1. Every trade shall examine substrate to determine if it is adequate to receive the work of that section prior to initiating work.
  2. Notify Contractor of any deficiencies needing correction.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

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**302 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

**303 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

**304 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize Standards of Practice for Professional Land Surveyors.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations.
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of control and survey work as it progresses.

**305 GENERAL INSTALLATION REQUIREMENTS**

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

**306 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Architect before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  - 2. Remove items indicated on drawings.
  - 3. Relocate items indicated on drawings.
  - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.
  - 4. Verify that abandoned services serve only abandoned facilities.
  - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

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1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
  2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- I. Clean existing systems and equipment.
- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. Comply with all other applicable requirements of this section.

**3.07 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- J. Patching:

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1. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
  2. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  3. Match color, texture, and appearance.
  4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

**3.08 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

**3.09 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

**3.10 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See appropriate Division 23 Section.

**3.11 FINAL CLEANING**

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Replace filters of operating equipment.

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- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
  - H. Clean site; sweep paved areas, rake clean landscaped surfaces.
  - I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

**3.12 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect.
- B. The Contractor shall generate and provide a punch-list to the Architect prior to requesting inspection for substantial completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Accompany Architect on Contractor's preliminary final inspection.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

**3.13 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 01 7419  
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

**PART 1 GENERAL**

**101 WASTE MANAGEMENT REQUIREMENTS**

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- E. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

**102 RELATED REQUIREMENTS**

- A. Section 01 2500 - Substitution Procedures.
- B. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- D. Section 01 6000 - Product Requirements: Waste prevention requirements related to product substitutions.
- E. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- F. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

**103 DEFINITIONS**

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

#### **104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
  1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
  2. Submit Report on a form acceptable to Owner.
  3. Landfill Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  4. Incinerator Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
    - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  5. Recycled and Salvaged Materials: Include the following information for each:
    - a. Identification of material, including those retrieved by installer for use on other projects.
    - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
  6. Material Reused on Project: Include the following information for each:
    - a. Identification of material and how it was used in the project.
    - b. Amount, in tons or cubic yards.
    - c. Include weight tickets as evidence of quantity.
  7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.



## **PART 2 PRODUCTS**

### **201 PRODUCT SUBSTITUTIONS**

- A. See Section 01 6000 and Section 01 2500.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
  - 1. Relative amount of waste produced, compared to specified product.
  - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
  - 3. Proposed disposal method for waste product.
  - 4. Markets for recycled waste product.

## **PART 3 EXECUTION**

### **301 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

### **302 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
  - 1. Prebid meeting.
  - 2. Preconstruction meeting.
  - 3. Regular job-site meetings.
  - 4. Job safety meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  - 1. As a minimum, provide:
    - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
    - b. Separate dumpsters for each category of recyclable.
    - c. Recycling bins at worker lunch area.
  - 2. Provide containers as required.
  - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
  - 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
  - 5. Locate enclosures out of the way of construction traffic.
  - 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  - 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
  - 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

**END OF SECTION**

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**SECTION 01 7800  
CLOSEOUT SUBMITTALS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

**102 RELATED REQUIREMENTS**

- A. General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

**103 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. All record documents, warranties and O&M manuals are to be submitted in paper format (1 copy) along with 3 copies of CD's or PDF's of the documents.
- B. At completion of Project, the Contractor shall submit to Architect a complete set of clearly marked-up Project Documents, as follows:
  - 1. One (1) Original Set clearly marked as-built, record drawings and specifications.
  - 2. Three (3) copies of CD's or DVD's: Each with as-built record drawings and as-built record specifications along with O&M Manuals and Warranties.
- C. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit one paper set and three CD's of revised final documents in final form within 10 days after final inspection, each with as-built record drawings and as-built record specifications along with O&M Manuals and Warranties as referenced above.
- D. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.
  - 4. Submit CD's with PDF's of as-built record drawings and as-built record specifications along with O&M Manuals and Warranties as referenced above.

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**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**301 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish first floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - 5. Details not on original Contract drawings.
- G. Scan marked-up Record Drawings and Specifications onto three (3) CD's or DVD's (each with as-built record drawings and as-built record specifications).

**302 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

**303 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for

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cleaning and maintenance.

- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

**304 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

**305 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS**

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

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- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
  - C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
  - D. Prepare data in the form of an instructional manual.
  - E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
  - F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
  - G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
  - H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
  - I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
  - J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
  - K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
  - L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
  - M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
    - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
    - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      - a. Significant design criteria.
      - b. List of equipment.
      - c. Parts list for each component.
      - d. Operating instructions.
      - e. Maintenance instructions for equipment and systems.
      - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
    - 3. Part 3: Project documents and certificates, including the following:
      - a. Shop drawings and product data.
      - b. Air and water balance reports.
      - c. Certificates.
  - N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
  - O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed
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to content of the volume.

**306 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

**END OF SECTION**

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**SECTION 01 7900  
DEMONSTRATION AND TRAINING**

**PART 1 GENERAL**

**101 SUMMARY**

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
  - 1. All software-operated systems.
  - 2. HVAC systems and equipment.
  - 3. Plumbing equipment.
  - 4. Electrical systems and equipment.
  - 5. Conveying systems.
  - 6. Landscape irrigation.
  - 7. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
  - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
  - 2. Finishes, including flooring, wall finishes, ceiling finishes.
  - 3. Fixtures and fittings.
  - 4. Items specified in individual product Sections.

**102 RELATED REQUIREMENTS**

- A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.
- B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.
- C. Other Specification Sections: Additional requirements for demonstration and training.

**103 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
  - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
  - 2. Submit one copy to the Commissioning Authority, not to be returned.
  - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
  - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
  - 1. Submit to Architect for transmittal to Owner.
  - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
  - 3. Submit not less than four weeks prior to start of training.
  - 4. Revise and resubmit until acceptable.
  - 5. Provide an overall schedule showing all training sessions.
  - 6. Include at least the following for each training session:
    - a. Identification, date, time, and duration.
    - b. Description of products and/or systems to be covered.
    - c. Name of firm and person conducting training; include qualifications.

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- d. Intended audience, such as job description.
  - e. Objectives of training and suggested methods of ensuring adequate training.
  - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
  - g. Media to be used, such as slides, hand-outs, etc.
  - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
- 1. Include applicable portion of O&M manuals.
  - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
  - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
- 1. Identification of each training session, date, time, and duration.
  - 2. Sign-in sheet showing names and job titles of attendees.
  - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
  - 4. Include Commissioning Authority's formal acceptance of training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
- 1. Format: DVD Disc.
  - 2. Label each disc and container with session identification and date.

#### **104 QUALITY ASSURANCE**

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
- 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
  - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION**

##### **301 DEMONSTRATION - GENERAL**

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
- 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
  - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

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- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
    - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

**302 TRAINING - GENERAL**

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
  - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
  - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
  - 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
  - 1. Review the applicable O&M manuals.
  - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
  - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
  - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
  - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
  - 6. Discuss common troubleshooting problems and solutions.
  - 7. Discuss any peculiarities of equipment installation or operation.
  - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
  - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
  - 10. Review spare parts and tools required to be furnished by Contractor.
  - 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

**END OF SECTION**

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**SECTION 01 9113  
GENERAL COMMISSIONING REQUIREMENTS**

**PART 1 GENERAL**

**101 SUMMARY**

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
  - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
  - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
  - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
  - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

**102 SCOPE OF COMMISSIONING**

- A. The following are to be commissioned:
- B. Plumbing Systems:
- C. HVAC System, including:
- D. Special Ventilation:
- E. Electrical Systems:
- F. Electronic Safety and Security:
- G. Communications:
- H. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

**103 RELATED REQUIREMENTS**

- A. Section 01 7800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

**PART 2 PRODUCTS**

**201 TEST EQUIPMENT**

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
  - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.

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2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
  3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

### **PART 3 EXECUTION**

#### **3.01 COMMISSIONING PLAN**

- A. Commissioning Authority has prepared the Commissioning Plan.
1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
  2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
  2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
  3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
  4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

#### **3.02 STARTUP PLANS AND REPORTS**

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

#### **3.03 PREFUNCTIONAL CHECKLISTS**

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
1. No sampling of identical or near-identical items is allowed.
  2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
  3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:

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- a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
  - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
  - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
  - d. Serial number of installed unit.
  - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
  - f. Sensor and actuator calibration information.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
  2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
  3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
  4. If any Checklist line item is not relevant, record reasons on the form.
  5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
  6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
  7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
  2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
  3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
  4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
  2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

### **304 FUNCTIONAL TESTS**

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

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- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
  - D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
    - 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
    - 2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
    - 3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
    - 4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
    - 5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.
  - E. Functional Test Procedures:
    - 1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
    - 2. Examples of Functional Testing:
      - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
      - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
      - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
      - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
  - F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

### **305 SENSOR AND ACTUATOR CALIBRATION**

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial,



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intermediate and final results.

- C. All Sensors:
  - 1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
  - 2. Verify that sensors with shielded cable are grounded only at one end.
  - 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
  - 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
  - 1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
  - 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
  - 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
  - 1. Disconnect sensor.
  - 2. Connect a signal generator in place of sensor.
  - 3. Connect ammeter in series between transmitter and building automation system control panel.
  - 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
  - 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
  - 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
  - 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
  - 8. Reconnect sensor.
  - 9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
  - 10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
  - 11. If not, replace sensor and repeat.
  - 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
  - 1. Watthour, Voltage, Amperage: 1 percent of design.
  - 2. Pressure, Air, Water, Gas: 3 percent of design.
  - 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
  - 4. Relative Humidity: 4 percent of design.
  - 5. Barometric Pressure: 0.1 inch of Hg.
  - 6. Flow Rate, Air: 10 percent of design.
  - 7. Flow Rate, Water: 4 percent of design.
  - 8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
  - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
  - 2. Set pump/fan to normal operating mode.
  - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.

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4. Command valve/damper to open; verify position is full open and adjust output signal as required.
  5. Command valve/damper to a few intermediate positions.
  6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
    1. With full pressure in the system, command valve closed.
    2. Use an ultra-sonic flow meter to detect flow or leakage.

**306 TEST PROCEDURES - GENERAL**

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
  1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
  2. Sampling is not allowed for:
    - a. Major equipment.
    - b. Life-safety-critical equipment.
    - c. Prefunctional Checklist execution.
  3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
  4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
  5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
  6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
  7. If YY percent of the units in the second sample fail, test all remaining identical units.
  8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

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- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
  2. Other points will be monitored by the Commissioning Authority using dataloggers.
  3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
  4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
  5. Graphical output is desirable and is required for all output if the system can produce it.
  6. Monitoring may be used to augment manual testing.

**307 OPERATION AND MAINTENANCE MANUALS**

- A. See Section 01 7800 - Closeout Submittals for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

**END OF SECTION**

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SECTION 02 3213  
SUBSURFACE INVESTIGATION

PART 1 - GENERAL

101 GENERAL

- A. Subsurface investigation was conducted, and a report (Geotechnical Exploration dated May 16th, 2022, GMC Project No. GBHM220011) was issued by:
  - 1. GOODWYN, MILLS & CAWOOD, INC.
  - 2. Kevin W. Wales, P.E.
  - 3. 2400 Fifth Avenue South, Suite 200
  - 4. Birmingham, AL 35233
  - 5. Phone: (205) 879-4462
- B. The investigations are performed to assist the Architect and Consulting Engineers in the design of the project and are available to the Contractor as available information only.
- C. The Reports will be available for review at the Architect's offices.
- D. One (1) copy of the reports will be furnished to any General Contractor bidding this project who requests it, and to any Plan Rooms listed that request it.
- E. Upon request, properly qualified Subcontractors for Earthwork will also be provided one (1) copy of the reports.
- F. The reports are not part of the Contract Documents.
- G. Interpretation:
  - 1. Bidders shall make their own investigation of subsurface conditions, for neither the Owner nor the Architect assumes responsibility for the accuracy or completeness of the information contained in the report, nor will the Owner or the Architect be responsible for the additional compensation for work performed on the basis of Bidders' assumptions based on the report.
  - 2. Note however, that it is expected that Contractors will utilize the Owner's Reports of "Geotechnical Subsurface Investigation" (or similar name) much the same as have the Architect and Engineers. However, as indicated, neither the Owner nor the Architect accept any responsibility whatsoever for the information contained in the reports, nor for any interpretations others make based on the information contained therein.
    - a. In the event of unforeseen existing conditions encountered during the Work of the project, there are provisions within the Contract Documents to compensate the Contractor for any required and properly authorized additional work.
- H. Refer to other Sections of the Project Manual and the Drawings for additional information and requirements.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION

3.01 NOT APPLICABLE TO THIS SECTION.

END OF SECTION

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## SECTION 02 4100

### DEMOLITION

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of built site elements.
- C. Selective demolition of building elements for alteration purposes.
- D. Abandonment and removal of existing utilities and utility structures.

##### 1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. Section 01 7000 – Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- F. Section 31 1000 - Site Clearing: Vegetation and existing debris removal.
- G. Section 31 2000 – Earth Moving: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

##### 1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
  - 1. Areas for temporary construction and field offices.
  - 2. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
  - 2. Identify demolition firm and submit qualifications.
  - 3. Include a summary of safety procedures.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

#### 1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications:
  - 1. Company specializing in the type of work required.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
  - 1. Where required by local Health Department or other authorities having jurisdiction, provide certificate of pest and rodent eradication and subsequent inspection completed prior to and after building demolition.
- C. Pre-demolition Conference: Demolition will be reviewed at required Preconstruction Conference for the Project.
  - 1. In addition, conduct pre-demolition conferences at Project site with Owner's representatives, to provide final notice to and coordination with Owner's representatives and on-site personnel.
- D. Notices: Contractor shall provide all notices required by Code, applicable regulations, ordinances and/or local and other authorities having jurisdiction.
  - 1. All notices shall be in writing, with copies provided to the Owner and Engineer.



## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Fill Material: As specified in Section 31 2000 – Earth Moving.

## **PART 3 - EXECUTION**

### **3.1 SCOPE**

- A. Extent of demolition is indicated on the Plan.
- B. Remove paving and curbs as required to accomplish new work.
- C. Remove items indicated.
- D. Remove other items indicated, for salvage, relocation, and recycling.
- E. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 2000.
- F. Salvage, relocate, or recycle as directed and as applicable.
  - a. The Owner reserves the right of first refusal for any structures, materials, and/or accessory items on site or within the buildings including, but not limited to, fire alarm panels and accessories, door hardware, electrical transformers, copper tubing, onsite trees and shrubs, and other items of value that may or may not be shown on the plans or called out in the project manual. Any items removed from the site without prior approval from the Owner will be paid to the Owner by the contractor at two times (2x) the market value.
- G. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

### **3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
    - 1. Obtain required permits.
    - 2. Comply with applicable requirements of NFPA 241.
    - 3. Use of explosives is not permitted.
    - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
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5. Provide, erect, and maintain temporary barriers and security devices.
  6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  8. Do not close or obstruct roadways or sidewalks without permit.
  9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of Notification To Proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed and delivered to a location as directed by the Owner.
- D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- E. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. If hazardous materials are discovered during removal operations, stop work and notify Engineer and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
1. Removal of asbestos shall be subject to state and local regulatory requirements.
- H. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
  2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
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- I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

### **3.3 EXISTING UTILITIES**

- A. Coordinate work with utility companies.
  - 1. The locations of existing underground utilities are shown in an approximate manner only. The Contractor shall determine exact location of all existing utilities before commencing work. The contractor shall be fully responsible for any and all damages which might be occasioned by his failure to exactly locate and preserve any and all underground utilities. The Contractor shall contact Alabama One Call (811) a minimum of 48 hours prior to excavation and the City of Fort Payne a minimum of 5 days prior to excavation in order to give both entities enough time to mark utilities. If no paint is visible, Contractor shall not perform excavation until verifying with that work site is cleared for excavation.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 5 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

### **3.4 SELECTIVE DEMOLITION FOR ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as shown.
  - 2. Report discrepancies to Engineer or Engineers before disturbing existing installation.
  - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove items indicated on drawings.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
  - 2. Where existing active systems serve occupied facilities, but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
  - 3. Verify that abandoned services serve only abandoned facilities before removal.
  - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
  - 4. Patch as specified for patching new work.

### **3.5 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash and legally dispose of off-site.
- B. Remove from site all materials not to be reused on site; do not burn or bury.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

### **END OF DEMOLITION**

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**SECTION 03 3660  
SEALED CONCRETE FLOOR**

**PART 1 - GENERAL**

**101 SUMMARY**

- A. Section Includes:
  - 1. Floors denoted on Finish Schedule as SC (Sealed Concrete).
- B. Related Sections
  - 1. Drawings and general provisions of Contract, including General Conditions and Division 1 Specification Sections, apply to the work of this Section.
  - 2. Section 03300 - Concrete.

**102 SUBMITTALS**

- A. Contractor shall submit specified manufacturer's complete technical data sheets for all products to be used, including installation instructions.

**103 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer of specified sealer shall have a minimum 10 years experience in the production of the specified products.
- B. Contractor Qualifications: Contractor must have a minimum 3 years experience in sealing applications and successfully completed not less than 6 projects comparable in scale and complexity.
- C. Regulatory Requirements
  - 1. Products shall comply with the United States Clean Air Act for maximum Volatile Organic Compound (VOC) content as specified in PART 2 of this section.
- D. Mockups and Field Samples: Prepare field sample at project site for architects review and approval.
  - 1. Samples shall be constructed on site and shall be 4'x4'. If there is existing concrete, the Architect shall select an area where the samples will be placed.
  - 2. Construct sample-using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in sample panels.
  - 3. Sample shall be sealed by the individual workers who will actually be performing the work for the project.
  - 4. Obtain written approval of the sample from project Architect before start of work.
  - 5. Retain approved samples through completion of the work for use as a quality standard for finished work.
  - 6. The mockup may remain part of the finished work if approved.
- E. Mandatory Pre Pour Installation Conference: Conduct conference at project site to comply with requirements in Division 1 Sections "Special Conditions" and "Administrative Requirements".
  - 1. The mandatory preinstallation conference shall occur prior to any concrete pours.
  - 2. The purpose of the mandatory preinstallation conference is to review the criteria with the General Contractor, concrete subcontractor, concrete finish manufacturer, and concrete finish installer.
  - 3. The meeting shall establish the following:
    - a. Roles and expectations of each subcontractor.
    - b. Days and times of concrete pour schedules.
    - c. Sequencing of operations for pouring, curing, finishing and protection of finished concrete surfaces.

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls
  - 3. Slabs-on-grade.
  - 4. Concrete toppings
- B. Related Sections include the following:
  - 1. Section 02751 for concrete pavement and walks.
  - 2. COLOR STAINED CONCRETE - RESURFACING - SECTION 03032
  - 3. Division 5 for metals.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Shop Drawings, General:
  - 1. Submit all shop drawings on one reproducible print and two copies only. The reproducible print will be returned. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
  - 2. The contractor shall fill out the Concrete Submittal Checklist and include it as part of his mix design and/or shop drawing submittal package(s). Submittals without the checklist will be returned unchecked as an incomplete submittal. The checklist sheet is located at the end of this specification section.
    - a. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the checklist. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the checklist and subsequently not explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.

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3. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
  4. Contract documents shall not be used for shop drawing, including erection plans or details.
- B. Product Data: For each type of product indicated.
- C. Design Mixtures: Prepare design mixes for each type and strength of concrete by either laboratory trial mixtures or field experience methods as specified in ACI 318-05 Section 5.3. If trial mixtures method used, the contractor is to provide and use an independent testing facility for preparing and reporting proposed mix designs.
1. All concrete mix designs shall include the following information:
    - a. Proportions of cement, fine and coarse aggregate and water.
    - b. Water/cement ratio, design strength, slump and air content.
    - c. Type of cement and aggregates.
    - d. Type and dosage of all admixtures.
    - e. Type, color and dosage of integral coloring compounds, where applicable.
    - f. Special requirements for pumping.
    - g. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.
    - h. Dated test data for the laboratory trial mixture or field experience method.
    - i. Material certifications (materials shall meet the requirements of section 2.5 below)
      - 1) Cementitious materials.
      - 2) Admixtures.
      - 3) Aggregates
  2. Submit written reports to Architect and Structural Engineer of Record of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed and approved by Architect and Structural Engineer of Record.
- D. Contract documents shall not be used for shop drawing, including erection plans or details.
- E. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, wall elevations, and supports for concrete reinforcement.
- F. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Shop drawings for formwork, prepared for fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joint or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.
    - a. Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.
- G. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions for waterstops, vapor retarder and other products indicated by Architect.
- H. Qualification Data: For Installer, manufacturer and testing agency.
- I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
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1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- J. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
  2. Admixtures.
  3. Form materials and form-release agents.
  4. Steel reinforcement and accessories.
  5. Fiber reinforcement.
  6. Waterstops.
  7. Curing compounds.
  8. Floor and slab treatments.
  9. Bonding agents.
  10. Adhesives.
  11. Vapor retarders.
  12. Semirigid joint filler.
  13. Joint-filler strips.
  14. Repair materials.
- K. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- L. Field quality-control test and inspection reports.
- M. Minutes of preinstallation conference.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. The Owner shall employ an approved Testing Agency to perform concrete and concrete related tests and inspections (that are not specifically noted as the contractor's responsibility) as required by the Building Code, Project Documents, the Architect, and the Structural Engineer of Record.
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- E. The contractor shall employ at his expense an approved Testing Agency as defined above to perform the following:
1. Evaluation of trial mixtures and/or concrete testing for mix design submission.
  2. Qualification of proposed materials and establishment of concrete mixtures.
  3. Other testing services needed or required by the contractor.
- F. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.
- G. Testing Responsibilities of the Contactor:
1. Submit data on qualifications of Contractor's proposed testing agency. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.
  2. Furnish any labor necessary to assist Owner's testing agency in obtaining and handling samples at the project site or at the source of materials.
  3. Advise Owners Testing Agency at least 24 hours in advance of operations to allow for completion of quality tests and assignment of personnel.
  4. At the Contractor's expense, provide and maintain for the sole use of the Owner's Testing agency adequate facilities for the safe storage and proper curing of concrete test specimens on the project site for initial curing as required by ASTM C31.
- H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- I. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- J. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
  3. ACI 302 "Guide for Concrete Floor and Slab Construction".
  4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
  5. ACI 305 "Hot Weather Concreting".
  6. ACI 306 "Cold Weather Concreting".
  7. ACI 309 "Guide for Consolidation of Concrete".
  8. ACI 347 "Recommended Practice for Concrete Formwork".
  9. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
- K. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
- L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
-

- a. Contractor's superintendent.
- b. Independent testing agency responsible for concrete design mixtures.
- c. Ready-mix concrete manufacturer.
- d. Concrete subcontractor.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the products specified.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  1. Plywood, metal, or other approved panel materials.
  2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1 or better.
    - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    - c. Structural 1, B-B or better; mill oiled and edge sealed.
    - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces, and adhesion of membranes to concrete.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

### 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

### 2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. For slabs on grade, use chairs with sand plates or prefabricated plastic supports with wide base to prevent chairs from getting pushed into subbase during concrete pour.

### 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, gray or white. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C or F.
      - 1) Limit use of fly ash to not exceed 25 percent of cementitious content by weight.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
      - 1) Limit use of Ground Granulated Blast-Furnace Slag to not exceed 50 percent of cementitious content by weight.
  2. Blended Hydraulic Cement: ASTM C 595, Type [IS, portland blast-furnace slag] [IP, portland-pozzolan] [I (PM), pozzolan-modified portland] [I (SM), slag-modified portland] cement.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Use of admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C. Set-Accelerating Corrosion-Inhibiting Admixtures must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.
1. Available Products:
    - a. Boral Material Technologies, Inc.; Boral BCN.
    - b. Euclid Chemical Company (The); Eucon CIA.
    - c. Grace Construction Products, W. R. Grace & Co.; DCI.
    - d. Master Builders, Inc.; Rheocrete CNI.

- e. Sika Corporation; Sika CNI.
- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Non-Set-Accelerating Corrosion-Inhibiting Admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.
- 1. Available Products:
    - a. Axim Concrete Technologies; Catexol 1000CI.
    - b. Boral Material Technologies, Inc.; Boral BCN2.
    - c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
    - d. Master Builders, Inc.; Rheocrete 222+.
    - e. Sika Corporation; FerroGard-901.
- E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis. See architectural drawings and site plan for concrete requiring color pigment.
- 1. Available Manufacturers:
    - a. Bayer Corporation.
    - b. ChemMasters.
    - c. Conspec Marketing & Manufacturing Co., Inc.; a Dayton Superior Company.
    - d. Davis Colors.
    - e. Elementis Pigments, Inc.
    - f. Hoover Color Corporation.
    - g. Lambert Corporation.
    - h. Scofield, L. M. Company.
    - i. Solomon Colors.
  - 2. Color: As selected by Architect from manufacturer's full range.

## 2.7 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- 1. Available Manufacturers:
    - a. Bometals, Inc.
    - b. Greenstreak.
    - c. Meadows, W. R., Inc.
    - d. Tamms Industries, Inc.
    - e. Vinylex Corp.
  - 2. Profile: As indicated.
  - 3. Dimensions: As indicated; nontapered.

2.8 VAPOR RETARDERS

- A. Underslab Vapor Barrier 1: 15 mil minimum thickness, Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced, high density polyethylene, or polyolefin equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
  - 1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
  - 2. Basis of Design Product:
    - a. STEGO INDUSTRIES LLC Product Stego Wrap (15-mil) Vapor Barrier ; [www.stegoindustries.com](http://www.stegoindustries.com)
  - 3. Other Acceptable products
    - a. Fortifiber Building Systems Group Product Moistop Ultra® 15; [www.fortifiber.com](http://www.fortifiber.com).
    - b. Reef Industries Product Griffolyn 15 Mil ; [www.reefindustries.com](http://www.reefindustries.com).
    - c. W.R. Meadows Inc. Product PERMINATOR 15 ; [www.wrmeadows.com](http://www.wrmeadows.com).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 FLOOR AND SLAB TREATMENTS

- A. General: The contractor shall coordinate and insure that all floor and slab treatments, curing materials and compounds, finish floor materials, related materials, paints, and repair compounds are compatible.
- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces. To be applied where concrete indicated to be sealed in Architectural Drawings.
  - 1. Available Products:
    - a. Burke by Edoco; Titan Hard.
    - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
    - c. Dayton Superior Corporation; Day-Chem Sure Hard.
    - d. Euclid Chemical Company (The); Euco Diamond Hard.
    - e. L&M Construction Chemicals, Inc.; Seal Hard.
    - f. Meadows, W. R., Inc.; Liqui-Hard.
    - g. Nox-Crete Products Group, Kinsman Corporation; Duranox.
- C. For additional information on color stained concrete see 03032 Color Stained concrete specifications.

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2.10 CURING MATERIALS

- A. General: The contractor shall coordinate and insure that all floor and slab treatments, curing materials and compounds, finish floor materials, related materials, paints, and repair compounds are compatible. Evaporation retarder shall not be used where epoxy floor covering is to be placed; slab shall be wet cured with Absorptive Cover or Moisture-Retaining Cover as indicated below.
1. The contractor shall verify and be responsible for insuring the VOC emission limits of authorities having jurisdiction are not exceeded during the project.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Available Products:
    - a. Burke by Edoco; BurkeFilm.
    - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - c. Dayton Superior Corporation; Sure Film.
    - d. Euclid Chemical Company (The); Eucobar.
    - e. L&M Construction Chemicals, Inc.; E-Con.
    - f. Meadows, W. R., Inc.; Sealtight Evapre.
    - g. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
    - h. Sika Corporation, Inc.; SikaFilm.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet or natural fiber matting attached to plastic sheet backing. Acceptable product is Aquacure by DRC, exclusive distributor - Greenstreak Group, Inc. 800-325-9504, or equal.
- E. Water: Potable.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. Review curing compounds with manufacturer and waterproofing manufacturer to make sure curing compound does not inhibit adhesion.
1. Available Products:
    - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
    - b. Burke by Edoco; Aqua Resin Cure.
    - c. ChemMasters; Safe-Cure Clear.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
    - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
    - f. Euclid Chemical Company (The); Kurez DR VOX.
    - g. Kaufman Products, Inc.; Thinfilm 420.
    - h. Lambert Corporation; Aqua Kure-Clear.
    - i. L&M Construction Chemicals, Inc.; L&M Cure R.
    - j. Meadows, W. R., Inc.; 1100 Clear.
    - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
    - l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
    - m. Tamms Industries, Inc.; Horncrete WB 30.
    - n. Unitex; Hydro Cure 309.
    - o. US Mix Products Company; US Spec Maxcure Resin Clear.



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- p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
1. Available Products:
- a. Anti-Hydro International, Inc.; AH Clear Cure WB.
  - b. Burke by Edoco; Spartan Cote WB II.
  - c. ChemMasters; Safe-Cure & Seal 20.
  - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
  - e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
  - f. Euclid Chemical Company (The); Aqua Cure VOX.
  - g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
  - h. Lambert Corporation; Glazecote Sealer-20.
  - i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
  - j. Meadows, W. R., Inc.; Vocomp-20.
  - k. Metalcrete Industries; Metcure.
  - l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
  - m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
  - n. Tamms Industries, Inc.; Clearseal WB 150.
  - o. Unitex; Hydro Seal.
  - p. US Mix Products Company; US Spec Hydrasheen 15 percent
  - q. Vexcon Chemicals, Inc.; Starseal 309.
- H. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
1. Available Products:
- a. Burke by Edoco; Spartan Cote WB II 20 Percent.
  - b. ChemMasters; Safe-Cure Clear.
  - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; High Seal.
  - d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
  - e. Euclid Chemical Company (The); Diamond Clear VOX.
  - f. Kaufman Products, Inc.; SureCure Emulsion.
  - g. Lambert Corporation; Glazecote Sealer-20.
  - h. L&M Construction Chemicals, Inc.; Dress & Seal WB.
  - i. MBT Protection and Repair, Div. of ChemRex; MasterKure-N-Seal VOC.
  - j. Meadows, W. R., Inc.; Vocomp-20.
  - k. Metalcrete Industries; Metcure 0800.
  - l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 200E.
  - m. Sonneborn, Div. of ChemRex; Kure-N-Seal.
  - n. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
  - o. Tamms Industries, Inc.; Clearseal WB STD.
  - p. Unitex; Hydro Seal 18.
  - q. US Mix Products Company; US Spec Radiance UV-25
  - r. Vexcon Chemicals, Inc.; Starseal 0800.
- I. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
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1. Available Products:
  - a. Burke by Edoco; Cureseal 1315.
  - b. ChemMasters; Spray-Cure & Seal Plus.
  - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315.
  - d. Dayton Superior Corporation; Day-Chem Cure and Seal (J-22UV).
  - e. Euclid Chemical Company (The); Super Diamond Clear.
  - f. Kaufman Products, Inc.; Sure Cure 25.
  - g. Lambert Corporation; UV Super Seal.
  - h. L&M Construction Chemicals, Inc.; Lumiseal Plus.
  - i. Meadows, W. R., Inc.; CS-309/30.
  - j. Metalcrete Industries; Seal N Kure 0.
  - k. Sonneborn, Div. of ChemRex; Kure-N-Seal 5.
  - l. Tamms Industries, Inc.; LusterSeal 300.
  - m. Unitex; Solvent Seal 1315.
  - n. US Mix Products Company; US Spec CS-25
  - o. Vexcon Chemicals, Inc.; Certi-Vex AC 1315

J. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Available Products:
  - a. Burke by Edoco; Cureseal 1315 WB.
  - b. ChemMasters; Polyseal WB.
  - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315 WB.
  - d. Euclid Chemical Company (The); Super Diamond Clear VOX.
  - e. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
  - f. Lambert Corporation; UV Safe Seal.
  - g. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
  - h. Meadows, W. R., Inc.; Vocomp-30.
  - i. Metalcrete Industries; Metcure 30.
  - j. Symons Corporation, a Dayton Superior Company; Cure & Seal 31 Percent E.
  - k. Tamms Industries, Inc.; LusterSeal WB 300.
  - l. Unitex; Hydro Seal 25.
  - m. US Mix Products Company; US Spec Radiance UV-25.
  - n. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

K. For additional information on finishing and sealing floor surfaces to receive color stained concrete see COLOR STAINED CONCRETE - RESURFACING - SECTION 03032

## 2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 typically unless noted or aromatic polyurea at traffic areas with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

## 2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Concrete type, slump, air content, and maximum water to cementitious content shall be as shown on the Structural Drawings.
- C. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less

than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

E. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use of admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal
2. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
3. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
4. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
5. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

F. Slump Limits: Proportion and design mixes to result in slump at point of placement as shown on the drawings.

1. When use of a Type I or II plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C494 is permitted, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Building Members: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated in drawings.
2. Maximum Water-Cementitious Materials Ratio: As indicated in drawings.
3. Slump Limit: As indicated in drawings. 8 inches (200 mm), plus or minus 1 inch (25 mm), for concrete with verified slump indicated in drawings before adding high-range water-reducing admixture or plasticizing admixture].
4. Air Content: As indicated in drawings, at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. Mixing and delivery time shall not exceed 90 minutes.
  2. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
  2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
  2. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Convene preconstruction meeting prior to starting work. Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" and Structural Drawings for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

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1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  5. Space vertical joints in walls no further than 90' on center. Locate joints midway between piers integral with walls, near corners, and in concealed locations where possible.
  6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
  3. Slab reinforcement shall not cross contraction joints.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- 3.7 WATERSTOPS
- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- 3.8 CONCRETE PLACEMENT
- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.



- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with the recommendations and intent of ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301. Deliver concrete to meet the following minimum temperatures immediately after placement:
    - a. 55 deg F for sections less than 12in. in the least dimension.
    - b. 50 deg F for sections 12in. to 36in. in the least dimension.
    - c. 45 deg F for sections 36in. to 72in. in the least dimension.
    - d. 40 deg F for sections greater than 72in. in the least dimension.
    - e. The temperature of concrete as placed shall not exceed these values by more than 20 deg F.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
  2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
  3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with the recommendations and intent of ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

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- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
1. Apply scratch finish to surfaces indicated by Architect and to receive concrete floor toppings, to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated by Architect to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated by Architect, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated by Architect, where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate or aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate or aluminum granules over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
  2. After broadcasting and tamping, apply float finish.
  3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate or aluminum granules.
- H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

### 3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

### 3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations and intent of ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.

- b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.13 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions to concrete floors indicated in Architectural Drawings to be troweled and sealed.
  1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  2. Do not apply to concrete that is less than seven days' old unless otherwise required by manufacturer.
  3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Also see specification 01410 Structural Tests and Special inspections for additional information.
- B. Inspections:
1. Steel reinforcement placement.
  2. Steel reinforcement welding.
  3. Headed bolts and studs.
  4. Verification of use of required design mixture.
  5. Concrete placement, including conveying and depositing.
  6. Curing procedures and maintenance of curing temperature.
  7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
  2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

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- a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
  6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  7. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days. Compression test specimens for days not specified shall be at the contractors expense.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
  9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
  11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Structural Engineer of Record but will not be used as sole basis for approval or rejection of concrete.
  13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete at the Contractor's expense when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Structural Engineer of Record. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
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- 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
  
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

## CONCRETE SUBMITTAL CHECKLIST

*This submittal checklist must be provided with all concrete and reinforcing steel packages that are to be submitted to Structural Design Group. Absence of a properly completed checklist may result in the return of the submittal unchecked or as revise and resubmit.*

<b>MIX DESIGN</b>		
<b>Included?</b>	<b>Description</b>	<b>Location in project documentation where this requirement is located.</b>
<input type="checkbox"/>	Field data or trial mixture strength data	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Verify Mix Design Constraints Limit Fly Ash to 25% Limit Proportions per Spec Section 03300, Part II, Subsection 2.5 W/C ratio, Air, Slump per General Notes	Spec Section 03300, Part II, Subsection 2.5  General Notes – Section 4.0
<input type="checkbox"/>	Mix Design Data: 1. Proportions of cement, fine and coarse aggregate and water. 2. Water/cement ratio, design strength, slump and air content. 3. Type of cement and aggregates. 4. Type and dosage of all admixtures. 5. Type, color and dosage of integral coloring compounds, where applicable. 6. Special requirements for pumping. 7. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified. 8. Material certifications 1) Cementitious materials. 2) Admixtures. 3) Aggregates .	Spec Section 03300, Part I, Subsection 1.4  Spec Section 03300, Part I, Subsection 2.5, 2.6
<b>REBAR SHOP DRAWINGS</b>		
<b>Included?</b>	<b>Description</b>	<b>Location in project documentation where this requirement is located.</b>
<input type="checkbox"/>	Submit all shop drawings on one reproducible print and two reproductions only.	General Notes - Section 2.0 Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Contract documents not used for shop drawing.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Resubmitted shop drawings have all revised items clouded or identified.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Any requested information, clarifications, requests for approvals, modifications, etc. as listed in Spec Section 03300, Part I, Subsection 1.4 are included by the contractor below.	Spec Section 03300, Part I, Subsection 1.4

**FORMWORK, RE-SHORE, OTHER SHOP DRAWINGS**

Included?	Description	Location in project documentation where this requirement is located.
<input type="checkbox"/>	Submit all shop drawings on one reproducible print and two reproductions only.	General Notes - Section 2.0 Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Contract documents not used for shop drawing, including erection plans or details	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Resubmitted shop drawings have all revised items clouded or identified.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Any requested information, clarifications, requests for approvals, modifications, etc. as listed in Spec Section 03300, Part I, Subsection 1.4 are included by the contractor below.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Calculations stamped by an Engineer registered in the state where the project is located.	Spec Section 03300, Part I, Subsection 1.4

**QUESTIONS, ETC. PER SECTION 03300, PART I, SUBSECTION 1.4**

END OF SECTION 033000

SECTION 034100 - STRUCTURAL PRECAST CONCRETE - PLANT CAST

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

- A. This Section includes structural precast concrete units, including the following:
  - 1. Hollow-core slab units.
- B. Related Sections: The following sections contain requirements that relate to this Section.
- C. Cast-in-place concrete is specified in Division 3 Section "Cast-in-Place Concrete."
- D. Joint sealants and backing are specified in Division 7 Section "Joint Sealants."
- E. Applied finishes are specified in Division 9 Sections.

1.3 SUBMITTALS:

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.
- C. Mix design reports of proposed concrete mix as specified in Part 2 of this Section.
- D. Shop drawings prepared by or under the supervision of a qualified professional engineer, showing complete information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-section; location, size, and type of reinforcement, including special reinforcement; and lifting devices necessary for handling and erection.
  - 1. Indicate layout and dimensions, and identify each precast concrete unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.
  - 2. Provide location and details of anchorage devices that are to be embedded in other construction. Furnish templates, if required, for accurate placement.
- E. Samples of bearing pads.
- F. Test reports as required by provisions of this Section.

1.4 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except as otherwise indicated:
  - 1. ACI 301, "Specifications for Structural Concrete for Buildings."
  - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
  - 3. AWS D1.1, "Structural Welding Code: Steel."
  - 4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
  - 5. Prestressed Concrete Institute MNL 116, "Manual for Quality Control for Plants and Production of Precast Concrete Products."
- B. Fabricator Qualifications: Firm experienced in fabrication of precast concrete units similar to units required for this Project and that have a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in work.
  - 1. Fabricator must be a producer member of the Prestressed Concrete Institute (PCI) and/or participate in its Plant Certification Program.
- C. Design by Fabricator: Design precast slab units to support superimposed dead loads including the weight of masonry partition walls, and live loads as indicated on drawings and as required for compliance with local governing code requirements.
- D. Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged primarily in manufacturing of similar units, unless plant fabrication or delivery to Project site is impractical.
  - 1. If units are not produced at precast concrete fabricating plant, maintain procedures and conditions for quality control that are equivalent to plant production.
- E. Fire-Resistance Rated Precast Units: Where precast concrete units are shown or scheduled as requiring fire-resistance classification, provide units tested and listed by Underwriters Laboratories, Inc. (UL) in "Fire Resistance Directory", or with each unit bearing UL label and marking.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver the amount of precast concrete units needed in a timely manner to the Project site to ensure installation continuity.
- B. Store and handle the units at the Project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units at designated lift points.
- C. Deliver anchorage items that are to be embedded in other construction before starting such work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

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2.1 FORMWORK:

- A. Provide forms and, where required, form facing materials of metal, plastic, wood, or another acceptable material that is nonreactive with concrete and will produce required finish surfaces.
- B. Accurately construct forms, mortar-tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and for prestressed, pre-tensioning, and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL 116.
  - 1. Unless forms for plant-manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or movement during detensioning.
- C. Provide finish as directed by architects drawings for all exposed to view precast concrete beams and lintels. At a minimum the finish shall be rubbed smooth free of any pin holes and or honeycomb surfaces. Surface shall be of uniform color, texture and appearance. Provide all reveals in formwork as necessary to reproduce the visual lines shown on the architectural drawings. Do not attempt to tool or install reveals after beams have been cast.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Reinforcement: ASTM A185.
- D. Welded Deformed Steel Wire reinforcement: ASTM A497.
- E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations.
  - 1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are protected with plastic (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.3 PRESTRESSING TENDONS:

- A. Uncoated, 7-wire, stress-relieved strand complying with ASTM A 416. Use Grade 250 unless Grade 270 is indicated.
  - 1. A strand similar to above, but having the size and ultimate strength of wires increased so that the ultimate strength of the strand is increased approximately 15 percent, or a strand with increased strength but fewer number of wires per strand, may be used at manufacturer's option.

2.4 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C 150, Type I or Type III.
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- B. Aggregates: ASTM C 33, and as specified here. Provide aggregates from a single source for exposed concrete.
  - 1. Local aggregates not complying with ASTM C 33, but that have shown by special test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to Architect.
- C. Lightweight Aggregate: ASTM C 330.
- D. Water: Potable.
- E. Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water-Reducing Admixture: ASTM C 494, Type A, or other Type approved for fabricator's units.

2.5 CONNECTION MATERIALS:

- A. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A283, Grade C.
- B. Steel Shapes: ASTM A 36.
- C. Anchor Bolts: ASTM A 307, low-carbon steel bolts, regular hexagon nuts, and carbon steel washers.
- D. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, and hardened washers complying with ASTM A 325.
- E. Finish of Steel Units: Exposed units galvanized per ASTM A 153; others painted with rust-inhibitive primer.
- F. Bearing Pads: Provide bearing pads for precast concrete units as indicated on drawings.
  - 1. Random oriented fiber reinforced material capable of supporting a compressive stress of 3000 psi with no cracking splitting or delamination.
- G. Welding Electrodes: Comply with AWS standards.
- H. Accessories: Provide clips, hangers, and other accessories required to install project units and to support subsequent construction or finishes.

2.6 GROUT MATERIALS:

- A. Cement Grout: Portland cement, ASTM C 150 (Type I), and clean, natural sand, ASTM C 404. Mix at ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.



- B. Metallic Shrinkage-Resistant Grout: Premixed, factory-packaged ferrous aggregate grouting compound complying with ASTM C 1107, Grade B, with fluid consistency and a 30-minute working time.
- C. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C 1107, Grade B, with fluid consistency and a 30-minute working time.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Metallic Shrinkage-Resistant Grout:
    - a. 100 Non-Shrink Grout (Metallic), Conspec, Inc.
    - b. Firmix, Euclid Chemical Co.
    - c. Vibra-Foil, W.R. Grace.
    - d. Ferrogrout, L & M Construction Chemicals, Inc.
    - e. Embeco 885, Master Builders.
    - f. Portalico, Protex Industries, Inc.
    - g. Kemox G, Sika Chemical.
    - h. Ferrolith G, Sonneborn/Rexnord.
  - 2. Nonmetallic Shrinkage-Resistant Grout:
    - a. 100 Non-Shrink Grout (Non-Metallic), Conspec, Inc.
    - b. Supreme Grout, Cormix, Inc.
    - c. Sure Grip Grout, Dayton Superior.
    - d. Euco N.S., Euclid Chemical Co.
    - e. Crystex, L & M Construction Chemicals.
    - f. Masterflow 928, Master Builders, inc.
    - g. Sealtight 588 Grout, W.R. Meadows.
    - h. Propak, Protex Industries, Inc.
    - i. Set Non-Shrink, Set Products, Inc.
    - j. Stoncrete NM1, Stonhard, Inc.
    - k. Multi-Purpose Grout, Symons Corp.
    - l. Portland Expanding Grout (Non-Shrink), Target Products, Ltd.
    - m. Five Star Grout, U.S. Grout Corp.

2.7 MIX PROPORTION AND DESIGN:

- A. Prepare design mixes for each type of concrete required.
- B. Design mixes may be prepared by independent testing facility or by qualified precast manufacturing plant personnel at precast fabricator's option.
- C. Proportion mixes by either laboratory trial batch or field experience methods using materials to be employed on the Project for each type of concrete required complying with ACI 318.

1. Produce standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
    - a. Compressive strength -- 5000 psi minimum at 28 days.
    - b. Release strength for prestressed units -- 3500 psi.
  2. Produce lightweight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
    - a. Compressive strength -- 5000 psi minimum at 28 days.
    - b. Air-dry density -- not less than 90 nor more than 115 lb per cu. ft.
    - c. Release strength for prestressed units -- 3500 psi.
  3. Cure compression test cylinders using same methods as for precast concrete work.
- D. Submit written reports to Architect of proposed mix for each type of concrete at least 15 days prior to start of precast unit production. Do not begin concrete production until mixes and evaluations have been reviewed by Architect.
- E. Adjusting Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test date for revised mix designs and strength results must be submitted to and accepted by Architect before using in the Work.
- F. Admixtures: Use air-entraining admixture in concrete, unless otherwise indicated.
1. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.
  2. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.
- 2.8 FABRICATION:
- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116 and as specified for types of units required.
  - B. Job-Site Casting: Use ready-mix concrete for units produced at a location other than the precast concrete fabricating plant complying with ASTM C 94.
  - C. Ready-Mixed Concrete: Comply with requirements of ASTM C 94 and as specified here.
    1. Delete references for allowing additional water to be added to the batch for material with insufficient slump. Adding water to the batch is not permitted.
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- D. A shorter mixing time than that specified in ASTM C 94 may be required during hot weather or under conditions contributing to rapidly setting concrete.
  - 1. When the air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- E. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect the position of the main reinforcement or placing of concrete. Do not relocate bearing plates in units unless acceptable to Architect.
- F. Cast-in openings larger than 10 inches in diameter or 10 inches square in accordance with final shop drawings. Other smaller holes may be field cut by trades requiring them, as acceptable to Architect.
- G. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial formula form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.
- H. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
- I. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers and hangers, as required.
- J. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- K. Pre-tension tendons for prestressed concrete either by single-strand tensioning method or multiple-strand tensioning method. Comply with PCI MNL-116 requirements.
- L. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast units, complying with requirements of ACI 304. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items.
- M. Identify pick-up points and orientation in structure with permanent markings, complying with markings indicated on final shop drawings. Imprint casting date on each precast unit on a surface that will not show in the finished structure.
- N. Cure by low-pressure steam, steam vapor, radiant heat and moisture, or another similar process to accelerate concrete hardening and to reduce curing time.
- O. Delay detensioning prestressed concrete units until concrete has attained at least 70 percent of the design stress, as established by test cylinders.
  - 1. If concrete has been heat-cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.

2. Tendons pre-tensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- P. Finish formed surfaces of precast concrete as indicated for each type of unit, and as follows:
1. Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, and form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.
  2. Commercial Finish: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces are to be true, well-defined surfaces.
  3. Architecturally Exposed Finish: Provide finish as directed by architects drawings for all exposed to view precast concrete beams and lintels. At a minimum the finish shall be rubbed smooth free of any pin holes and or honeycomb surfaces. Surface shall be of uniform color, texture and appearance. Provide all reveals in formwork as necessary to reproduce the visual lines shown on the architectural drawings. Do not attempt to tool or install reveals after beams have been cast unless approved by the architect.
- Q. Finish unformed surfaces by trowel unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.
1. Apply scratch finish to precast concrete units that will receive concrete topping after installation. Following initial strikeoff, transversely scarify surface to provide ridges approximately 1/4 inch deep.
- 2.9 HOLLOW CORE SLAB UNITS:
- A. Type: Precast, prestressed concrete units with open voids running full length of slabs.
  - B. Furnish units that are free of voids or honeycomb, with straight true edges and surfaces.
  - C. Provide standard finish units unless otherwise indicated.
  - D. Fabricate units of concrete materials that will provide a minimum 3500 psi compressive strength at the time of initial prestress and a 28-day compressive strength of 5000 psi.
  - E. Adequately reinforce slab units to resist transportation and handling stresses.
  - F. Include cast-in weld plates where required for anchorage or lateral bracing to structural steel members.
  - G. Coordinate with other trades for installation of items to be cast-in hollow slab units.
  - H. Provide solid, monolithic, precast slab units indicated to be an integral part of the hollow slab unit system. Design and fabricate solid units to dimensions and details indicated as specified for hollow slab units.
  - I. Provide headers of cast-in-place concrete or structural steel shapes for openings larger than one
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slab width in accordance with hollow slab unit manufacturer's recommendations.

2.10 SOURCE QUALITY CONTROL:

- A. The Owner may employ an independent testing agency to evaluate precast manufacturer's quality control and testing methods.
- B. The precast manufacturer shall allow Owner's testing agency access to materials storage areas, concrete production equipment, and concrete placement and curing facilities. Cooperate with Owner's testing laboratory and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- C. Dimensional Tolerances: Units having dimensions smaller or greater than required and outside specified tolerance limits may be subject to additional testing as specified here.
- D. Precast units having dimensions greater than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to meet construction conditions.
- E. Strength of precast concrete units will be considered potentially deficient if the manufacturing processes fail to comply with any of the requirements that may affect the strength of the precast units, including the following conditions:
  - 1. Failure to meet compressive strength tests requirements.
  - 2. Reinforcement, and pre-tensioning and detensioning tendons of prestressed concrete not conforming to specified fabrication requirements.
  - 3. Concrete curing, and protection of precast units against extremes in temperature not as specified.
  - 4. Precast units damaged during handling and erection.
- F. Testing Precast Units: When there is evidence that the strength of precast concrete units may not meet specification requirements, the Owner's testing laboratory will take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C 42 and as follows:
  - 1. Take at least three representative cores from precast units of suspect strength, from locations directed by Architect.
  - 2. Test cores in a saturated-surface-dry condition per ACI 318 if concrete will be wet when using completed structure.
  - 3. Test cores in an air-dry condition per ACI 318 if concrete will be dry when using completed structure.
  - 4. Strength of concrete for each series of cores will be considered satisfactory if the average compressive strength is at least 85 percent of 28-day design compressive strength.

5. Test results will be made in writing on the same day that tests are made, with copies to Architect, Contractor, and precast manufacturer. Include in the test reports the Project identification name and number, date, name of precast concrete manufacturer, name of concrete testing laboratory; identification letter, name, and type of member or members represented by core tests; design compressive strength, compressive breaking strength and type of break (corrected for length-diameter ratio), and direction of applied load to core with respect to horizontal plane of concrete as placed.
- G. Patching: Where core test results are satisfactory and precast concrete units are acceptable for use in Work, solidly fill core holes with patching mortar and finish to match adjacent concrete surfaces.
- H. Defective Work: Remove precast concrete units that do not conform to specified requirements, including strength, tolerances, and finishes. Replace with precast concrete units that meet requirements of this section.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL:

- A. Bearing Pads: Install flexible bearing pads where indicated as precast concrete units are being erected. Set pads on level, uniform bearing surfaces and maintain in correct position until precast units are placed.
- B. Welding: Perform welding in compliance with AWS D1.1 and D1.4, including qualification of welders.
  1. Protect units from damage by field welding or cutting operations and provide non-combustible shield as required.
  2. Repair damaged metal surfaces by cleaning and applying a coat of galvanizing repair compound to galvanized surfaces and a compatible primer to painted surfaces.
- C. Powder-Actuated Fasteners: Do not use powder-actuated fasteners for attaching accessory items to the surface of a precast, prestressed unit unless otherwise accepted by precast manufacturer.
- D. Erection Tolerances: Install precast units without exceeding tolerance limits of PCI MNL-127, "Recommended Practice for Erection of Precast Concrete."
  1. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at connection and joints as follows:
    - a. Cement grout consisting of 1 part portland cement, 2-1/2 parts sand, and only enough water to properly mix and hydrate.
    - b. Shrinkage-resistant grout consisting of premixed compound and water to provide a flowable mixture without segregation or bleeding.
    - c. Provide forms or other acceptable method to retain grout in place until sufficiently hard to support itself. Pack spaces with stiff grout material, tamping until voids

are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

END OF SECTION 034100

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**104 DELIVERY, STORAGE AND HANDLING**

- A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.
- B. Store specified products in conditions recommended by the manufacturer.

**105 JOB SITE CONDITIONS**

- A. Environmental Conditions: Maintain an ambient temperature of between 50° F and 90° F during application and at least 48 hours after application.
- B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Prosoco, Inc.: [www.prosoco.com](http://www.prosoco.com).
- B. Dayton Superior Corporation: [www.daytonsuperior.com](http://www.daytonsuperior.com).
- C. Substitutions: See Section 01600 - Product Requirements.

**202 PRODUCTS**

- A. Densifier: a concrete hardener chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.
  - 1. Ameripolish 3D HS; Ameripolish, Inc.
  - 2. SASE SFS D2; SASE Company, Inc.
  - 3. COnsolideck LS; PROSOCO.
  - 4. No substitutions allowed.
- B. Control Joint and Saw Cut Filler, two part polyurea.
  - 1. Hi-Tech HT-PE85; Hi-Tech Systems.
  - 2. Spal-Pro RS-88; Metzger/McGuire.
  - 3. Euclid QuickJoint 200, (Grey Only); Euclid Chemical Company.
  - 4. No Substitutions Allowed.
- C. Substitutions: The use of any products other than those specified will be considered providing that the contractor requests its use in writing within fourteen (14) days prior to bid date. This request shall be accompanied by:
  - 1. A certificate of compliance from the material manufacturer stating that the proposed products meet or exceed the requirements for this specification.
  - 2. Documented proof that the proposed material has a five (5) year proven record of performance for sealing, hardening and densifying concrete substrates, confirmed by at least two (2) local projects that the Architect can examine.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

**302 PREPARATION**

- A. New Concrete



1. Apply sealer/densifier immediately after final finishing and installation of control joints (if manufacturer's recommendations permit); when the concrete surface won't be marred by foot traffic and after joints have been cut and cleaned or anytime thereafter. Remove soft cut saw debris prior to applying sealer/densifier. Surface shall be swept, and mopped or
2. pressure-washed as necessary to insure no dirt, grit, trash, or similar items mar finished product. Remove all markings, including paint, marker or pencil marks. Inspect floor surface prior to application to be sure it is ready for sealer/densifier.

### **303 APPLICATION OF SEALER**

#### **A. New Concrete**

1. The surface shall be sealed with a sealer produced of the type specified under Products above.
  - a. Also apply manufacturer's protection coat as specified above.
2. Apply at the rates and method recommended by manufacturer in written instructions which the installer shall have at the job site.
3. Apply a single coat using low pressure sprayer fitted with 0.5 gal/min spray tip. Lightly apply sufficient product to wet the surface without producing puddles. Use clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
4. If surfaces dry immediately, increase the rate of application. Surfaces should remain wet 5 to 10 minutes. Adjust rate of application to eliminate puddles. Any white residue must be removed immediately.
5. Allow treated surfaces to dry.
6. For uncured steel troweled concrete, immediately apply the specified curing compound or initiate specified curing procedure.
7. When the curing process is complete, use an automatic floor scrubber equipped with cleaning pads or brushes appropriate for removal of accumulated construction soiling and surface residues. Avoid pads or brushes which may damage the finished floor.

### **304 PROTECTION**

- A. Protection: General Contractor shall protect areas to receive sealed concrete finish at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured.
- B. Do not allow any trade to park any vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
- C. Diaper all hydraulic powered equipment to avoid staining of the concrete.
- D. Place no steel on interior slab to avoid rust stains and gouges. If construction dictates necessity of this, interior slab will be protected with 1/2-inch plyboard.
- E. Do not allow acids and acidic detergents to come into contact with slab.
- F. Inform all trades that the slab must be protected at all times.
- G. Protect finished work until fully cured in accordance with manufacturer's recommendations.
- H. Protect completed floor from damage until Substantial Completion.
  1. Do not allow vehicle and pedestrian traffic on unprotected floor.
  2. Do not allow construction materials, equipment, and tools on unprotected floor.
- I. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed floor.
- J. Repair damaged areas of completed floor to satisfaction of Architect.

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- K. Protect floor from traffic for at least 72 hours after final application of sealer.
  - L. Plywood slab protection in traffic corridors, entry ways, and areas to receive sealer shall be provided by and maintained by General Contractor throughout construction until the finishing contractor takes ownership of the floor. Protection shall be sufficient to protect surface from damage due to traffic and impact from any and all construction activities with a minimum of 1/2" plywood. All seams of plywood shall be sealed to eliminate passage of debris to new floor.
  - M. Protect slab during masonry work and after completion of sealer work with minimum of 1/2-inch plyboard, with sealed seams.
  - N. Upon completion of sealer, the General Contractor and the finishing subcontractor shall replace the plywood protection for the duration of the project.

**305 MAINTENANCE**

- A. Sealed floors should be maintained by sweeping. Spills should be cleaned when they occur and dirt shall be rinsed off with water. Heavily soiled areas may be wet-cleaned by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Interior floors that require polishing should be maintained using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

**END OF SECTION 03366**

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**SECTION 04 2000  
UNIT MASONRY**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Concrete block.
- B. Concrete building brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

**102 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete: Installation of dovetail slots for masonry anchors.
- B. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

**103 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- G. ASTM C55 - Standard Specification for Concrete Building Brick; 2022.
- H. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2022.
- I. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.
- J. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2022.
- K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
- L. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.
- O. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- P. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.
- Q. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- R. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

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- S. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
  - T. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
  - U. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
  - V. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.
  - W. UL (FRD) - Fire Resistance Directory; Current Edition.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.

**105 QUALITY ASSURANCE**

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Fire Rated Assemblies: Comply with applicable code for UL requirements for fire rated masonry construction.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

**PART 2 PRODUCTS**

**201 CONCRETE MASONRY UNITS**

- A. Concrete Block: Comply with referenced standards and as follows:
  - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
  - 2. Special Shapes: Provide nonstandard blocks configured for corners.
    - a. Provide bullnose units for outside corners.
  - 3. Load-Bearing Units: ASTM C90, normal weight.
    - a. Hollow block, as indicated.
    - b. Exposed Faces: Manufacturer's standard color and texture.
  - 4. Nonloadbearing Units: ASTM C129.
    - a. Hollow block.

- b. Medium weight.

**202 BRICK UNITS**

- A. Manufacturers:
1. Belden Brick; \_\_\_\_\_: [www.beldenbrick.com/#sle](http://www.beldenbrick.com/#sle).
  2. General Shale Brick; \_\_\_\_\_: [www.generalshale.com/#sle](http://www.generalshale.com/#sle).
  3. Meridian Brick LLC; Athens Architectural Series: [www.meridianbrick.com/#sle](http://www.meridianbrick.com/#sle).
  4. Substitutions: See section 01 6000 - Product Requirements.

**203 MORTAR AND GROUT MATERIALS**

- A. Masonry Cement: ASTM C91/C91M, Type S.
- B. Portland Cement: ASTM C150/C150M, Type I.
1. Not more than 0.60 percent alkali.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.
- G. Packaged Dry Material for Mortar for Unit Masonry: Premixed masonry cement and mason's sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
1. Type: Type N.
  2. Color: Standard gray.
  3. Water-repellent mortar for use with water-repellent masonry units.

**204 REINFORCEMENT AND ANCHORAGE**

- A. Manufacturers:
1. Blok-Lok Limited; \_\_\_\_\_: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
  2. FEROCORP; FEROCORP Thermal Tie \_\_\_\_\_: [www.ferocorp.com/#sle](http://www.ferocorp.com/#sle).
  3. Hohmann & Barnard, Inc; X-Seal Anchor: [www.h-b.com/#sle](http://www.h-b.com/#sle).
  4. TruFast Walls, a division of Altenloh, Brinck & Co. US, Inc; Thermal-Grip MVA: [www.trufastwalls.com/#sle](http://www.trufastwalls.com/#sle).
  5. WIRE-BOND; \_\_\_\_\_: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
  6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss or ladder.
  2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
  3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- E. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.

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- G. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

**205 FLASHINGS**

- A. Metal Flashing Materials: As specified in Section 07 6200.
- B. Metal Flashing Materials:
1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

**206 ACCESSORIES**

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
1. Manufacturers:
    - a. Blok-Lok Limited; \_\_\_\_\_: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
    - b. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
    - c. WIRE-BOND; \_\_\_\_\_: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
  - B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
    1. Manufacturers:
      - a. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
      - b. WIRE-BOND; \_\_\_\_\_: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
      - c. Substitutions: See Section 01 6000 - Product Requirements.
  - C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
    1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
  - D. Weeps:
    1. Type: Polyester mesh.
    2. Color(s): As selected by Architect from manufacturer's full range.
    3. Manufacturers:
      - a. Advanced Building Products, Inc; \_\_\_\_\_: [www.advancedbuildingproducts.com/#sle](http://www.advancedbuildingproducts.com/#sle).
      - b. Blok-Lok Limited; \_\_\_\_\_: [www.blok-lok.com/#sle](http://www.blok-lok.com/#sle).
      - c. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
      - d. WIRE-BOND; \_\_\_\_\_: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
      - e. Substitutions: See Section 01 6000 - Product Requirements.
  - E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

**207 MORTAR AND GROUT MIXING**

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
1. Masonry below grade and in contact with earth: Type M.
  2. Exterior, loadbearing masonry: Type S.
  3. Exterior, non-loadbearing masonry: Type S.
  4. Interior, loadbearing masonry: Type S.
  5. Interior, non-loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

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**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

**302 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

**303 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
- B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

**304 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches.
  - 3. Mortar Joints: Concave.
- D. Brick Units:
  - 1. Bond: Running.
  - 2. Coursing: Three units and three mortar joints to equal 8 inches.
  - 3. Mortar Joints: Concave.

**305 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.



- H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- I. Isolate masonry partitions from vertical structural framing members with a control joint.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

**3.06 WEEPS/CAVITY VENTS**

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

**3.07 CAVITY MORTAR CONTROL**

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

**3.08 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY**

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.
- G. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

**3.09 MASONRY FLASHINGS**

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
  - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
  - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
  - 1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
  - 2. Anchor vertical leg of flashing into backing with a termination bar and sealant.
  - 3. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel flat drip with hemmed edge.
- D. Support flexible flashings across gaps and openings.
- E. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

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**3.10 GROUTED COMPONENTS**

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening unless otherwise noted in structural drawings.

**3.11 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints unless otherwise noted in structural drawings. See sheet S0.01 .
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joint as detailed on drawings.

**3.12 TOLERANCES**

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation from Alignment of Columns: 1/4 inch.
- C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.
- I. Maximum Variation for Vertical Alignment of Head Joints: 1/4 inch in 10 ft, 1/2" maximum.

**3.13 CUTTING AND FITTING**

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

**3.14 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements and Section 01 4533 - Special Inspections
- B. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

**3.15 CLEANING**

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

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**3.16 PROTECTION**

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

**END OF SECTION**

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**SECTION 04 7200  
CAST STONE MASONRY**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Architectural cast stone.
- B. Units required are:
  - 1. Exterior wall units, including water tables.

**102 RELATED REQUIREMENTS**

- A. Section 04 0511 - Masonry Mortaring and Grouting: Mortar for setting cast stone.
- B. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- C. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

**103 REFERENCE STANDARDS**

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.
- E. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2019, with Editorial Revision (2020).
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- J. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).
- K. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.
- L. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- M. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Mortar Color Selection Samples.
- E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

- F. Source Quality Control Test Reports.
- G. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
  - 2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
  - 3. Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
  - 4. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

**106 MOCK-UPS**

- A. Provide full size cast stone components for installation in mock-up of exterior wall.
- B. See Section 01 4000 - Quality Requirements for additional requirements.
- C. Approved mock-up will become standard for appearance and workmanship.
- D. Remove mock-up not incorporated into the work and dispose of debris.

**107 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Architectural Cast Stone:
  - 1. Any current producer member of the Architectural Precast Association.
  - 2. Any current producer member of the Cast Stone Institute.

**202 ARCHITECTURAL CAST STONE**

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural granite, complying with ASTM C1364.
  - 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
  - 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.

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3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
  4. Color: Selected by Architect from manufacturer's full range.
  5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
  2. Unless otherwise indicated on drawings, provide:
    - a. Wash or slope of 1:12 on exterior horizontal surfaces.
    - b. Drips on projecting components, wherever possible.
    - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.
1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

### **203 MATERIALS**

- A. Portland Cement: ASTM C150/C150M.
1. For Units: Type I, white or gray as required to match Architect 's sample.
  2. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.
- E. Admixtures: ASTM C494/C494M.
- F. Water: Potable.
- G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
1. Galvanized in accordance with ASTM A767/A767M, Class I.
- H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.
- K. Mortar: Portland cement-lime, as specified in Section 04 0511 ; do not use masonry cement.
- L. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

### **204 SOURCE QUALITY CONTROL**

- A. Test compressive strength and absorption of specimens selected at random from plant production.
1. Test in accordance with ASTM C642.
  2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.
  3. Submit reports of tests by independent testing agency, showing compliance with requirements.

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**PART 3 EXECUTION**

**301 INSTALLATION**

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
  - 1. Drench cast stone components with clear, running water immediately before installation.
  - 2. Set units in a full bed of mortar unless otherwise indicated.
  - 3. Fill vertical joints with mortar.
  - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

**302 TOLERANCES**

- A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
  - 1. Rake mortar joints 3/4 inch for pointing.
  - 2. Remove excess mortar from face of stone before pointing joints.
  - 3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
  - 4. Leave the following joints open for sealant:
    - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
    - b. Joints in projecting units.
    - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
    - d. Joints below lugged sills and stair treads.
    - e. Joints below ledge and relieving angles.
    - f. Joints labeled "expansion joint".
- B. Installation Tolerances:
  - 1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
  - 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
  - 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
  - 4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

**303 REPAIR**

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 10 feet.
- B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
- C. Repair methods and results subject to Architect 's approval.

**304 CLEANING**

- A. Keep cast stone components clean as work progresses.
- B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
  - 1. Wet surfaces with water before applying cleaner.
  - 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
  - 3. Remove cleaner promptly by rinsing thoroughly with clear water.
  - 4. Do not use acidic cleaners.



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**305 PROTECTION**

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed or stained work to condition of new work.

**END OF SECTION**

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## SECTION 051200 - STRUCTURAL STEEL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. For additional information on exterior steel painting see specification section 09910.

#### 1.2 SUMMARY

- A. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
  - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
  - 2. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
  - 3. Refer to Division 3 for anchor bolt installation in concrete and Division 4 for anchor bolt installation in masonry.

#### 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  - 1. Submit all shop drawings as directed by the architect.
- B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards). This data is submitted for information only.
  - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
  - 2. High-strength bolts (each type), including nuts and washers.
    - a. Include Direct Tension Indicators if used.
  - 3. Structural steel primer paint.
  - 4. Shrinkage-resistant grout.
- C. Shop drawings including complete details and schedules for fabrication and assembly of structural

steel members, procedures, and diagrams.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  2. Include embedment drawings.
  3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  5. Contract documents shall not be used for shop drawing, including erection plans or details.
  6. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
  7. All structural steel connections not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor.
  8. For structural-steel connections indicated to comply with design loads, include structural analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
  9. For each connection, the following shall be noted on the shop drawings:
    - a. Required design reaction
    - b. Calculation sheet number for design
    - c. Capacity of detailed connection
    - d. Stamp of Engineer submitting calculations for the connection
  10. All shop drawings which do not provide this information will be returned unchecked as an incomplete submittal.
- D. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.

#### 1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges", dated June 10, 1992.
    - a. General: AISC "Code of Standard Practice" shall apply except to the extent that references are made to the responsibility of the Owner and/or Architect or Engineer in which event those references shall have no applicability. Where a conflict exists between the Code of Standard Practice and the Contract Documents, the Contract Documents shall govern.
  2. AISC "Specifications for Structural Steel Buildings," including "Commentary".
  3. AISC "Specifications for Structural Steel Buildings, Section 10, Architecturally Exposed Structural

Steel".

4. "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections.
  5. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."
  6. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
  2. If re-certification of welders is required, retesting will be Contractor's responsibility.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.
  1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Structural Steel: ASTM A992, Grade 50 for wide flange beams; ASTM A36 elsewhere.
- C. Cold-Formed Steel Tubing: ASTM A500, Grade B.
- D. Hot-Formed Steel Tubing: ASTM A501.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.

- F. Moment Connection Material: Unless noted otherwise on the drawings, stiffener plates, doubler plates, gusset plates and the connecting plates shall be the same grade of steel as members being connected.
- G. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.
- H. Anchor Rods: ASTM A307 Grade A, headed type with supplementary requirements S1, unless otherwise indicated.
- I. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts.
  - 1. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.
- J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
  - 1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325.
    - a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B695, Class 50, or hot-dip galvanized complying with ASTM A153.
  - 2. Quenched and tempered alloy steel bolts, nuts, and washers, complying with ASTM A490.
- K. Electrodes for Welding: Comply with AWS Code.
- L. Structural Steel Primer Paint: Red oxide primer.
- M. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- N. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. 100 Non-Shrink Grout (Non-Metallic); Conspec, Inc.
    - b. Supreme Grout; Cormix, Inc.
    - c. Sure Grip Grout; Dayton Superior.
    - d. Euco N.S.; Euclid Chemical Co.
    - e. Crystex; L & M Construction Chemicals, Inc.
    - f. Masterflow 713; Master Builders.
    - g. Sealtight 588 Grout; W. R. Meadows.
    - h. Propak; Protex Industries, Inc.

- i. Set Non-Shrink; Set Products, Inc.
- j. Five Star Grout; U.S. Grout Corp.

## 2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
  - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
  - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
  - 1. Bolt field connections, except where welded connections or other connections are indicated.
    - a. Provide high-strength threaded fasteners for all principal bolted connections, except where unfinished bolts are indicated.
- C. Simple Beam Connections: Standard double angle framed beam connections using bolts as specified.
  - 1. Seated Beam Connections and Stiffened Seated Beam Connections shall not be used unless indicated on the drawings or unless Engineer approval is obtained to verify capacity of supporting member for the resulting eccentricity. The fabricator must verify and bear responsibility that the use of such connections does not interfere with Architectural or MEP requirements.
- D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts."
- E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- G. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.
- H. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
- I. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

## 2.3 SHOP PAINTING

- A. General: Shop-paint structural steel, except those members or portions of members to be embedded
-

- in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
1. Do not paint surfaces to be welded or high-strength bolted with slip-critical-type connections.
  2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
  3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- B. Painting: Provide a one-coat, shop-applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.
- C. Painting of steel exposed to weathering in the finished configuration of the structure:
1. Surface Preparation: Clean surfaces to be painted. Remove rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:  
  
SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.
  2. Prime Coat: Immediately after surface preparation, provide one coat of grey shop applied Organic Zinc Rich Urethane Primer, such as Tnemec 90-97, at 2.5 to 3.5 mils DFT which meets the following performance requirements:
    - a. Solids by Volume: 63%
    - b. Zinc Content: 83% by weight.
    - c. Salt Spray (Fog): ASTM B 117, Scribed Panels, 50,000 hours exposure.
    - d. Adhesion: ASTM 4541 – Type V – no less than 2,083 psi (14.36 MPa) pull.
    - e. Prohesion: ASTM G85 Prohesion Cabinet Testing. 15,000 hours.
    - f. Cathodic Disbondment: ASTM G8, Method A.
    - g. Immersion: ASTM D 870 Potable Water Immersion. 7 year exposure.
    - h. AISC Static Fatigue: Primer shall meet requirements of a Class B surface with a mean slip coefficient no less than 0.50 and a tension creep not in excess of .005 inch over SSPC-SP6 prepared substrate.
  3. Touch Up Primer/Preparation before Finish Coats: Immediately after erection all surfaces shall be cleaned per SSPC – SP1 followed by spot repair preparation of SSPC-SP11 Power tool clean to white metal. Remove all foreign materials and contaminants, clean field welds, bolted connections, and abraded areas of shop paint. All damaged and abraded areas shall have feathered edges. Field touch-up with one coat of Prime Coat, paint applied at 2.5-3.5 Mil DFT prior to finish coat.
  4. Intermediate Coat: Provide one grey finish coat of an Aliphatic Acrylic Polyurethane, such as Tnemec Series 1075 Endura-Shield II, at 3.0 to 5.0 mils DFT which meets the following performance requirements:
    - a. Solids by Volume: 71%
    - b. Salt Spray (Fog): ASTM B 117, 2,000 hours exposure.
    - c. Abrasion: ASTM 4060 (CS-17 Wheel, 1,000 gram load, 1,000 cycles). No more than 139 mg loss.
    - d. Adhesion: ASTM 4541 – no less than 1,423 psi (9.81 MPa) pull.
    - e. Flexibility: ASTM D 522 (Method A) – no less than 14.4% elongation.
-



- f. Hardness: ASTM 3363- no gouging with an HB or less pencil.
  - g. Humidity: ASTM 4585- 4,000 hours exposure.
  - h. Impact: ASTM B 2794 – no cracking or delamination of film after 35 inch-pounds direct impact.
  - i. Prohesion: ASTM G85 – 10,000 hours exposure.
5. Finish Coat: Provide one finish coat (color to be selected by architect) of an Advanced Thermoset Solution Fluoropolymer, such as Themec Series 1070 Fluoronar, at 2.0 to 3.0 mils DFT which meets the following performance requirements:
- a. Solids by Volume: 60%
  - b. Salt Spray (Fog): ASTM B 117 – 10,000 hours exposure
  - c. Abrasion: ASTM 4060 – (CS-17 Wheel, 1,000 gram load, 1,000 cycles) no more than 103 mg loss.
  - d. Adhesion: ASTM 4541 – Type V – no less than 1,930 psi(13.3 MPa) pull.
  - e. Flexibility: ASTM D 522 (Method A)- no less than 14.83% elongation.
  - f. Hardness: ASTM 3363 – no gouging with an 8H or less pencil.
  - g. Humidity: ASTM 4585 – 3,000 hours exposure.
  - h. Impact: ASTM B 2794 - no cracking or delamination of film after 35 inch-pounds direct impact.
6. Any Field Painting to be brush or roller applied.
7. Owners testing agent to continuously review the surface preparation and application of the painting of steel exposed to weathering in the finished configuration of the structure.

## 2.4 SOURCE QUALITY CONTROL

- A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
- 1. Promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
- 1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

## PART 3 - EXECUTION

### 3.1 ERECTION

- A. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before

erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.

- B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
- D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
  - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
  - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
  - 4. For proprietary grout materials, comply with manufacturer's instructions.
- E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- F. Level and plumb individual members of structure within specified AISC tolerances.
- G. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- H. Splice members only where indicated and accepted on shop drawings.
- I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces. Each erection bolt on shop drawings shall be noted "Erection Bolt".
  - 1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  - 2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary

structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

- K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  - 1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

### 3.2 QUALITY CONTROL

- A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- F. Field Inspections and Tests:
  - 1. Check steel as received in the field for possible shipping damage workmanship, piece making and verification of required camber.
- G. Shop-Bolted Connections:
  - 1. Inspect or test in accordance with AISC specifications.
  - 2. For bolted connections (bearing-type), all connections shall be visually observed to assure that all bolts, nuts and washers are in place and that all plies of connection material have been drawn together. All bolts shall be verified to be snug tight only.
- H. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
  - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
  - 2. Perform visual inspection of all welds, including but not limited to fit-up, intermediate passes and final weld.
  - 3. Perform tests of welds as follows. Inspection procedures listed
    - a. Ultrasonic Inspection: ASTM E164. Perform on all full and partial penetration welds.

- I. Field-Bolted Connections:
  - 1. Inspect in accordance with AISC specifications.
  - 2. For bolted connections (bearing-type), all connections shall be visually observed to assure that all bolts, nuts and washers are in place and that all plies of connection material have been drawn together. All bolts shall be verified to be snug tight only.
  - 3. Bolts in slotted holes at expansion joints shall have nuts finger tight with threads damaged.
- J. Field Welding: Inspect and test during erection of structural steel as follows:
  - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
  - 2. Perform visual inspection of all welds, including but not limited to fit-up, intermediate passes and final weld.
  - 3. Perform tests of welds as follows:
    - a. Ultrasonic Inspection: ASTM E164. Perform on all full and partial penetration welds.

END OF SECTION 051200

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SECTION 052200 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes steel joists for roof framing. Types of joists required include the following:
  - 1. K-Series Open Web Steel Joists.
- B. Refer to Division 3 Sections for installation of anchors set in concrete.
- C. Refer to Division 4 Sections for installation of anchors set in masonry.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data and installation instructions for each type of joist and accessories.
  - 1. Include manufacturer's certification that joists comply with SJI "Specifications" and SJI Plant certification.
- C. Shop drawings showing layout of joist members, special connections, joining and accessories. Include mark, number, type, location and spacing of joists and bridging.
  - 1. Provide templates or location drawings for installation of anchor rods and metal bearing plates.
- D. Design Calculations: Submit for record one copy of design calculations, sealed by an engineer registered in the state where the project is located, for joist with cantilevers or concentrated loads or joist sizes for which standard load tables are not applicable.

1.4 QUALITY ASSURANCE

- A. General: Provide joists fabricated in compliance with Steel Joist Institute (SJI) "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society (AWS) "Structural Welding Code - Steel," AWS D1.1.
- C. Inspection: Inspect joists in accordance with SJI "Specifications."

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel joists as recommended in SJI "Specifications." Handle and store joists

in a manner to avoid deforming members and to avoid excessive stresses.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Steel: Comply with SJI "Specifications" for chord and web sections.
- B. Steel Bearing Plates: ASTM A 36.
- C. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.
- D. Steel Prime Paint: Comply with SJI "Specifications."

### 2.2 FABRICATION

- A. General: Fabricate steel joists in accordance with SJI "Specification."
- B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
- C. Extended End: Provide extended ends on joists where indicated, complying with SJI "Specifications" and load tables.
- D. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- E. Top Chord Extension: Provide top chord extensions ("R" type) on joists where indicated, complying with SJI "Specifications" and load tables.
- F. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI "Specifications."
  - 1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
- G. End Anchorage: Provide end anchorages, including steel bearing plates, to secure joists to adjacent construction, complying with SJI "Specifications."
- H. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.
- I. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.
  - 1. Apply one shop coat of steel prime paint to joists and accessories, by spraying, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 - EXECUTION

3.1 ERECTION

- A. Place and secure steel joists in accordance with SJI "Specifications," final shop drawings, and as herein specified.
- B. Anchors: Furnish anchor rods, steel bearing plates, and other devices to be built into concrete and masonry construction.
- C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
- D. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
  - 1. Where "open-web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.
- E. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.
- F. Fastening Joists: Comply with the following:
  - 1. Field weld joists to supporting steel framework and steel bearing plates where indicated in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
  - 2. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.
    - a. Use unfinished threaded fasteners for bolted connections, unless otherwise indicated.
- G. Touch-Up Painting: After joist installation, wire brush welded areas, abraded or rusty surfaces, and clean with solvent. Paint field-applied bolt heads and nuts and prepared surfaces on joists and steel supporting members. Use same type of paint as used for shop painting.

END OF SECTION 052200



SECTION 053100 - STEEL ROOF DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including general and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Roof deck.
- 2. Composite floor deck.

- B. Related Sections include the following:

- 1. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
- 2. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
- 3. Division 09 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

- 1. Submit all shop drawings as directed by the architect.

- B. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.

- 1. Provide test data for mechanical fasteners used fastening deck to supporting structures.

- C. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:

- 1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members."
  - 2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."
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3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."
- B. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.
  1. Welded decking in place is subject to inspection and testing. General Contractor will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be unsatisfactory. Remove work found to be defective and replace with new acceptable work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
  1. Roof Deck, Inc.
  8. United Steel Deck, Inc.
  9. Vulcraft Div., Nucor Corp.

### 2.2 MATERIALS

- A. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications.
- B. Miscellaneous Steel Shapes: ASTM A 36.
- C. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.
- D. Galvanizing: ASTM A 525, G60.
- E. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

### 2.3 PRODUCTS

- A. ROOF DECK.
  1. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
  2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade **33**, **G60** zinc coating.
  3. Deck Profile: SEE PLAN
  4. Profile Depth: SEE PLAN
  5. Design Uncoated-Steel Thickness: SEE PLAN
  6. Span Condition: Triple span or more.
  7. Side Laps: Overlapped or butted over support at contractor's option

B. COMPOSITE FLOOR DECK

1. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
3. Profile Depth: 3"
4. Design Uncoated-Steel Thickness: see plan
5. Span Condition: See Plan

2.4 ACCESSORIES:

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. Mechanical Fasteners: Corrosion-resistant self-drilling, self-threading screws.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- H. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.
- I. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

2.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

2.3 ROOF DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members AS INDICATED IN DRAWINGS:
  - 1. Anchor Diameter: SEE PLAN.
  - 2. Screw Spacing: SEE PLAN
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps as noted on drawings. Fasten perimeter edges of at intervals not exceeding 12" and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws or 5/8" diameter puddle welds as indicated on drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:
  - 1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

#### 2.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
  1. Weld Diameter: See Plan.
  2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart and as indicated on plan.
- B. Side-Lap Fastening: Fasten side laps between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:
  1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
  2. Mechanically clinch or button punch.
  3. Fasten with a minimum of 1 ½ inch long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches and joints as follows:
  1. End Joints: Lapped or butted at Contractor's option
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

#### 2.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
- F. Test all weld studs according to applicable standards.

2.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

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## SECTION 054000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes Design and or Build work of the following:
  - 1. Exterior load-bearing wall framing.
  - 2. Exterior non-load-bearing wall framing.
  - 3. Roof rafter framing.
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
  - 3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
- C. The extent of cold formed metal framing is shown on the drawings, including notes, elevations and details to show basic layout and location of members, typical connections, and type of steel required.
- D. Section includes all work and supplementary items required to complete the proper installation of the pre-engineered cold formed metal framing as shown on the drawings and specified herein including headers, outriggers, supplemental rafters and incidental framing for a cold formed metal framing assembly within the extent shown on the drawings.
- E. Cold formed metal framing includes planar structural units consisting of welded, screwed or bolted connected members which are fabricated, cut and assembled prior to delivery or at the job site.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated. Design bridging and other temporary and permanent bracing for same loads as used to design cold formed metal framing plus any temporary loads and permanent loads resulting laterally bracing of members.
  - 1. Engineering Responsibility: Manufacturer's responsibilities include using a qualified professional engineer to prepare structural analysis data for cold formed metal framing. All cold formed metal framing not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor, under the direct supervision of a professional engineer registered in the State where the project is located. Engineer/firm shall provide proof of professional liability insurance for said engineering responsibility.



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- a. Design calculations for the Cold formed metal framing designed by the Contractor shall be submitted for the files of the Architect and Engineer. Calculations shall bear the seal of a professional engineer registered in the State where the project is located. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal.
2. Design Loads: As follows:
    - a. Dead Loads: Weights of materials and construction.
    - b. Roof Live Loads: 20 PSF
    - c. Wind Loads: As indicated in drawings.
    - d. Seismic Loads: As indicated in drawings.
  3. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height.
    - b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
    - c. Roof Rafter Framing: Horizontal deflection of 1/240 of the horizontally projected span up to ¾ inch total dead load and ¾ inch total live load.
  4. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 60 deg F (67 deg C).
  5. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 1/2 inch (13 mm).
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
  2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- 1.4 SUBMITTALS
- A. This project is a 'Total Design and or Build' construction delivery system and review of submittals by the Owner or his representative does not relieve the 'Design and or Build' Contractor of design duties, construction responsibility or liability for improper design, function or performance. The review by Owner is not an independent design check of final plans and methods of construction by and will not in any way relieve the 'Design and or Build' contractor of sole design and construction responsibility for the successful completion and long term stability of the work.
  - B. Product Data: For each type of cold-formed metal framing product and accessory indicated.
  - C. Shop Drawings: Show layout, spacing, sizes, thicknesses, pitch, span, camber and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing,

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bridging, splices, accessories, connection details, and attachment to adjoining work. Shop drawings shall include all placement sequences and instructions.

1. Submit all shop drawings on three copies only unless specified in the general conditions. Two prints will be returned to the architect. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
2. Architect's and Engineer's Shop Drawing Review: Review of shop drawings will be for general considerations only. Compliance with requirements for materials, fabrication, engineering, dimensions, bracing, and erection is the Contractor's responsibility.
3. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the cover sheet to the submittal. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the cover sheet and subsequently explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.
4. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation licensed to practice in the state where the project is located. Shop drawings which do not contain this information will be returned unchecked.
5. Submittals shall additionally conform to the requirements shown on the General Notes of the project Structural Drawings.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

#### 1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

- D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
  - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- G. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### 1.6 FABRICATOR'S QUALIFICATIONS

- A. Cold formed metal framing shall be designed, fabricated, and erected by a firm which has a record including a minimum of five years of successfully designing, fabricating, and erecting cold formed metal framing assemblies similar to scope required and which practices a quality control program. Fabricators shall additionally be qualified with at least one year experience in using Building Information Modeling (BIM) from inception to producing shop drawings.
- B. Fabricators who wish to qualify for approval under this Section of the specification shall submit evidence of compliance with this specification no later than ten (10) days prior to the bid date. Only those fabricators approved in writing by the Architect prior to the bid date will be accepted.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.
- C. Do not store materials on structure in a manner that might cause distortion or damage to supporting structures.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

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- B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
1. AllSteel Products, Inc.
  2. California Expanded Metal Products Company.
  3. Clark Steel Framing.
  4. Dale/Incor.
  5. Dietrich Metal Framing; a Worthington Industries Company.
  6. Formetal Co. Inc. (The).
  7. Innovative Steel Systems.
  8. MarinoWare; a division of Ware Industries.
  9. Southeastern Stud & Components, Inc.
  10. Steel Construction Systems.
  11. Steeler, Inc.
  12. Super Stud Building Products, Inc.
  13. United Metal Products, Inc.

## 2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: Minimum of Grade 33 or as required by structural performance.
  2. Coating: G60 (Z180).
- B. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 50 (340), Class 1 or 2 or as required by structural performance.
  2. Coating: G90 (Z275).

## 2.3 EXTERIOR LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
  2. Minimum Flange Width: 1-5/8 inches (41 mm).
  3. Section Properties: as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm) or matching steel studs.
  2. Minimum Flange Width: 1-1/4 inches (32 mm).
  3. Section Properties: as required by structural performance.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18ga

2. Minimum Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:

1. Minimum Base-Metal Thickness: 18 ga
2. Top Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

## 2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. Minimum Flange Width: 1-5/8 inches (41 mm).
3. Section Properties: as required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 18 ga or matching steel studs.
2. Minimum Flange Width: 1-1/4 inches (32 mm)].
3. Section Properties: as required by structural performance.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Dietrich Metal Framing; a Worthington Industries Company.
  - b. MarinoWare, a division of Ware Industries.
  - c. SCAFCO Corporation
  - d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Dietrich Metal Framing; a Worthington Industries Company.
  - b. MarinoWare, a division of Ware Industries.

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- c. SCAFCO Corporation
  - d. The Steel Network, Inc.
  - 3. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
  - 4. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
- E. Contractors' Option Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
    - b. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
  - 2. Inner Track: Of web depth indicated, and as follows:
    - a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
    - b. Flange Width: outer deflection track flange width plus 1 inch (25 mm).
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

## 2.5 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 18 ga.
  - 2. Flange Width: 1-5/8 inches (41 mm) minimum.
  - 3. Section Properties: as required by structural performance.
- B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section rafter track, with unstiffened flanges; unpunched; of web depths indicated; and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm) or Matching steel rafters.
  - 2. Flange Width: 1-5/8 inches (41 mm, minimum).

## 2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.

2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Rafter hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

## 2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

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- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.9 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
1. Fabricate framing assemblies using jigs or templates.
  2. Cut framing members by sawing or shearing; do not torch cut.
  3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
  4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).
- D. Cold formed metal framing to be fabricated at the fabricator's shop in the largest sections possible to transport and erect.
- E. All cold formed metal framing shall be fabricated and erected in strict accordance with the current printed instructions of the approved subcontractor or fabricator.
- F. All cold formed metal framing components shall be straight and true prior to fabrication. Flattening or straightening of components, when necessary, shall be accomplished in a manner so as to not damage the component.
- G. All cold formed metal framing components shall be cut neatly to fit snugly against adjacent members.
- H. No splices will be allowed in cold formed metal framing except as authorized in writing by the Architect or as shown on the approved shop drawings.
- I. Framing components shall be field or shop fabricated and joined to one another by means of welding or through the use of screws.



- J. Completed cold formed metal framing shall be free from twists, bends, or open joints with all members straight and true to line.
- K. Welds must be thoroughly cleaned and wire brushed and primed and painted with a high zinc content paint capable of providing an equal or greater degree of protection than the original G-60 galvanized coating.
- L. Bridging: Fabricate horizontal or diagonal type bridging for cold formed metal framing as required to prevent buckling of members where sheathing applied to the cold formed metal framing members is not present or is not adequate to brace the cold formed metal framing member. Bridging shall transfer all forces to the roof diaphragm.
- M. End Anchorage: Fabricate end anchorages to secure cold formed metal framing to adjacent construction.
- N. Fabricate all clips, angles, henways and other miscellaneous pieces necessary to attach cold formed metal framing to the substructure or to attach other components within this section to one another.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Structural Adequacy: Contractor shall prepare the structure to insure proper and adequate structural support for the materials specified.
- B. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- C. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- D. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or rafter locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- E. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or rafter locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed rafters, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

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3.4 EXTERIOR LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: To match stud spacing.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
  - 1. Stud Spacing: 16 inches (406 mm).
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
  - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
  - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
  - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced a minimum of 48 inches (1220 mm) apart or as required by structural performance. Fasten at each stud intersection.
  - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
  - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: 16 inches (406 mm).
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Install single-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
  - 4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows but not more than 48 inches (1220 mm) apart or as required by structural performance. Fasten at each stud intersection.
  - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    - a. Install solid blocking at 96-inch (2440-mm) centers.
  - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

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3.6 ROOF RAFTER INSTALLATION

- A. Install perimeter rafter track sized to match rafters. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install rafter bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten rafters to both flanges of rafter track.
  - 1. Install rafters over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
  - 2. Reinforce ends and bearing points of rafters with web stiffeners, end clips, rafter hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space rafters not more than 2 inches (51 mm) from abutting walls, and as follows:
  - 1. Rafter Spacing: 24 to 48 inches or as required by structural performance.
- D. Frame openings with built-up rafter headers consisting of rafter and rafter track, nesting rafter, or another combination of connected rafters if indicated.
- E. Install rafter reinforcement at interior supports with single, short length of rafter section located directly over interior support, with lapped rafters of equal length to rafter reinforcement.
  - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals as required by structural performance. Fasten bridging at each rafter intersection as follows:
  - 1. Bridging: Rafter-track solid blocking of width and thickness indicated, secured to rafter webs.
  - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and rafter-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of rafters and secure solid blocking to rafter webs.
- G. Secure rafters to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous rafter framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable rafter-framing assembly.

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports per Specification Section 01410.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- F. Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements regardless of when testing agency completed inspection, observation or testing.

**3.8 REPAIRS AND PROTECTION**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

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**SECTION 05 5000  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.
- B. Downspout boots.
- C. Ladders.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.
- D. Section 05 5100 - Metal Stairs.
- E. Section 05 5213 - Pipe and Tube Railings.
- F. Section 07 7123 - Manufactured Gutters and Downspouts: Downspouts to which downspout boots are to be attached.
- G. Section 07 7200 - Roof Accessories: Roof Hatch.
- H. Section 09 9100 - Painting: Paint finish.

**103 REFERENCE STANDARDS**

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- I. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- J. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.
- K. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.
- L. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.



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- M. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
  - N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.
  - O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
  - P. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.
  - Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
  - R. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
  - S. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
  - T. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
  - U. SSPC-SP 2 - Hand Tool Cleaning; 2018.

**1.04 DESCRIPTION OF WORK**

- A. Work described in this section includes metal fabrications, which include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere. Types of work in this section includes metal fabrications for:
  - 1. Rough hardware.
  - 2. Loose bearing and leveling plates.
  - 3. Loose steel lintels.
  - 4. Miscellaneous framing and supports.
  - 5. Ladders.
  - 6. Guard posts (bollards), with concrete fill and matching metal domed cap welded on post.
  - 7. Downspout boots.
  - 8. Stair nosings and treads.
  - 9. Anchor plates, channels and/or angles with anchor bolts; galvanized.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Samples: Submit representative samples of materials and finished products as may be requested by Architect.

**1.06 QUALITY ASSURANCE**

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

**1.07 PROJECT CONDITIONS**

- A. Field Measurements: Where fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate

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construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting acceptable to fabricator's professional engineer, and in a manner that will not affect structural performance, deflection, safety, etc.

**108 COORDINATION**

- A. Coordinate installation of anchorages for metal fabrications and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation, without delaying the work of this section or the Work of the project.

**PART 2 - PRODUCTS**

**201 MATERIALS**

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

**202 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Stainless Steel: Type 304.
- D. Plates: ASTM A283/A283M.
- E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- G. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.
- H. Galvanized Structural Sheet Steel: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
- I. Steel Pipe: ASTM A 53; Type and grade (If applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
- J. Gray Iron Castings: ASTM A 48, Class 30.
- K. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
- L. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- M. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153
- N. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- O. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- P. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

**203 MATERIALS - ALUMINUM**

- A. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

- B. Aluminum-Alloy Die Castings: ASTM B85/B85M.

**204 MATERIALS - ACCESSORIES**

- A. Grout: Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE-CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- B. Fasteners:
1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
- C. Paint:
1. Metal Primer Paint: Southern Coating "Heavy Duty RIP Primer 1-0900", Themec "10-99 Primer", or approved equivalent.
  2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09 9000 - PAINTING.
  3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with Military Specifications MIL-P-21035 (Ships), or SSPC-Paint-20.
  4. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187 for all fabrications in contact with concrete or masonry.

**205 FABRICATION**

- A. Field verify ladder dimensions prior to fabrication.
- B. Fit and shop assemble items in largest practical sections, for delivery to site.
- C. Fabricate items with joints tightly fitted and secured.
- D. Continuously seal joined members by continuous welds.
- E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- F. Exposed Mechanical Fastenings (if any): Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- G. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

**206 FABRICATED ITEMS**

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
  2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
  3. Space rungs 7 inches from wall surface.
- B. Hatch Access Ladder:
1. Type: Fixed, wall mounted, vertical, aluminum, heavy duty, hatch access ladder. 20 feet maximum height. Side rails 3 inches above finish floor.
  2. Nominal Height: As indicated on drawings.
  3. Side Rails: 1-3/4 inches wide by 3 inch tubes with 1/8 inch wall thickness.
  4. Rungs: 1-1/4 inches wide by 1-1/4 inches tubes by 24 inches long (unless indicated otherwise) with corrugated surfaces and capable of 1,000 pounds load. Space 12 inches on center. Attach rungs in centerline of side rails by welding.
  5. Accessories:

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- a. Wall brackets: Support ladder at top and bottom and at 48 inches maximum intermediate points with 2 by 1/4 inch minimum flat bar aluminum wall brackets. Allow 7 inches minimum clearance from wall to center line of rungs.
  - b. Security Door: Provide hinged security door to cover bottom rungs and prevent unauthorized roof access.
    - 1) Construction: Fabricate from 11 gage flat aluminum sheet covering front of ladder. Provide side flanges extending toward wall and meeting aluminum flange mounted to wall.
    - 2) Equip door with continuous aluminum hinge and lock.
  - c. Safety Post Extension: Post extension for fixed ladders constructed of tubular aluminum sections with adjustable mounting brackets for attachment to top of ladder.
    - 1) Operation: Upward and downward movement controlled by manual operation. Manually locks when fully extended.
  - 6. Manufacturer/Product: UPNOVR, Inc.; "Model U-200": [www.upnovr.com](http://www.upnovr.com). Substitutions: Section 01 6000 - Product Requirements.
- C. Roof Access Ladder:
- 1. Manufacturer:
    - a. ACL Industries, Inc., (603) 668-1276: [www.aclindustries.com](http://www.aclindustries.com).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Product: Aluminum Fixed Access Ladder.
    - a. Material: Aluminum.
    - b. Fabrication: All-welded; High-strength aluminum components; Deep Serrated Rungs - 1000 lb. loading; Meets OSHA/ANSI A14.3 Standards.
    - c. Finish: Powder-Coated: Color - As Selected.
    - d. With Security Door (Access Guard).
    - e. Heavy Duty, with Platform, and Return to Rear Parapet.
    - f. Model: ACL-203.
- D. Bollards: Steel pipe, concrete filled, crowned metal cap, as detailed; prime paint finish. Color to be determined by Architect.
- E. Metal Grating: Metal floor grating system and fastener accessories, as detailed and indicated in the Drawings.
- 1. Manufacturer:
    - a. McNICHOLS CO., (855.997.0397): [www.mcnichols.com](http://www.mcnichols.com)
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Product: Standard-Duty Welded, Rectangular Bar (BASIS OF DESIGN)
    - a. Finish: Galvanized
    - b. Location: As indicated in the drawings
    - c. Accessories: Hot Dipped Galvanized Fasteners, quantity and spacing per manufacturer recommendation
- F. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; galvanized finish.
- G. Lintels: As detailed; galvanized finish.
- H. Downspout Boot: Cast Iron, Shape: Square or rectangular. Length: As indicated. Size: Coordinate with downspout size. Neenah R-4926-29 Series Downspout Shoes [Basis of Design], or approved equal.
- 1. Factory primed, for field painting.

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- I. Ribbed Bar Abrasive Nosing & Tread: Nosing type for concrete pour and steel pan stairs. Abrasive bar locked into extruded channels.
1. Base and nosing: Extruded aluminum type 6063-T5.
  2. Tread abrasive filler: Bar type ribbed. Consisting of aluminum oxide and/or silicon carbide. Binder: UV protected 2-part epoxy continuous throughout tread. Color: Black, unless indicated otherwise, and extending uniformly throughout filler.
  3. Bar width: 1-7/8 inches.
  4. Installation fastening type: Drilled countersunk holes.
  5. Product: Nystrom Model C1.875D, or approved equal. Substitutions: Section 01 6000 - Product Requirements.
- J. Miscellaneous framing and supports:
1. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
  2. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
  3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise shown, space anchors 24-inches o.c. and provide minimum anchor units of 1-1/4-inches wide x 1/4-inch x 8-inch long steel straps.
  4. Galvanize exterior miscellaneous frames and supports
- K. Rough hardware:
1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in DIVISION 6 sections.
  2. Fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

## **207 PREFABRICATED LADDERS**

- A. Roof Access Ladder:
1. Manufacturer:
    - a. ACL Industries, Inc., (603) 668-1276: [www.aclindustries.com](http://www.aclindustries.com).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  2. Product: Aluminum Fixed Access Ladder.
    - a. Material: Aluminum.
    - b. Fabrication: All-welded; High-strength aluminum components; Deep Serrated Rungs - 1000 lb. loading; Meets OSHA/ANSI A14.3 Standards.
    - c. Finish: Powder-Coated: Color - As Selected.
    - d. With Security Door (Access Guard).
    - e. Heavy Duty, with Platform, and Return to Rear Parapet.
    - f. Model: ACL-203.

## **208 DOWNSPOUT BOOTS**

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
1. Configuration: Offset.

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2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
  3. Color: To be selected by Architect from manufacturer's standard range.
  4. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
  5. Manufacturers:
    - a. Downspoutboots.com, a division of J. R. Hoe & Sons;\_\_\_\_\_: [www.downspoutboots.com/#sle](http://www.downspoutboots.com/#sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

**209 FINISHES - STEEL**

- A. Prime paint steel items.
  1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for exterior finish.
  2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Surface Preparation:
  1. Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specification and environmental exposure conditions of installed metal fabrications:
  2. Exterior (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
  3. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."
- E. Prime Painting: One coat.
- F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
- H. Lintels: Paint after galvanizing. Paint to match HM door frames.
- I. Bollards: Paint after installation.
- J. ASTM A 386 for galvanizing assembled steel products.
- K. Stainless Steel: #4 finish, unless indicated otherwise.

**210 FABRICATION GENERAL**

- A. Workmanship:
  1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
  2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
  3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
  4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown, or if not shown, Phillips flat-head (countersunk) screws or bolts.

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5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
  6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
  7. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- B. Alternating Stairs: Carbon Steel: Gas metal arc welded with treads spot welded to stringers and bolt-on handrails with included bolts using the specified materials.

**211 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

**302 PREPARATION**

- A. Clean and strip primed steel items to bare metal and aluminum where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- D. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete insets, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- E. Coordinate provision of access ladder with provision of roof hatch to ensure height and position of ladder is compatible with roof hatch curb.
- F. Coordinate ladder installation with construction of walls to insure walls are adequately reinforced, cells grouted, blocked, and supported for attachment of brackets and support of ladder.
- G. Insulate dissimilar metals to prevent electrolysis with bituminous paint or non-absorptive isolation pad to prevent contact.

**303 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Install manufactured items in accordance with manufacturer's directions. Comply with governing regulations, and industry standards applicable to the work.
  1. Use fasteners of type and size recommended by manufacturer.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Alternating tread stair:

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1. Comply with manufacturer's instructions.
  2. Install bumper in accordance with manufacturer's instructions.
  3. Prepare mounting holes.
  4. Position alternating tread stair with top tread at same elevation as upper finished floor.
  5. Secure with not less than 2 bolts or studs at top and with not less than 2 bolts or studs at bottom of stair.
  6. Touch up with matching paint any chipped or abraded damage to factory finish.
- E. Ship's Ladder:
1. Comply with manufacturer's instructions.
- F. Coordinate ladder installation with construction of walls to ensure adequate support and blocking for attachment of brackets and support of ladder.
- G. Ensure ladder is vertical, plumb, aligned with center of roof hatch, and rigid.
- H. Field weld components as indicated on drawings.
- I. Perform field welding in accordance with AWS D1.1/D1.1M.
- J. Obtain approval prior to site cutting or making adjustments not scheduled.
- K. After erection, prime welds, abrasions and surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.
- L. Install security door assembly of ladder and adjust for smooth operation.
- M. Safety post extension: Attach to top 2 rungs of ladder and centered between side rails. Adjust post to extend 42 inches above top tail when roof hatch is open and post is fully extended.

**304 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**



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**SECTION 05 5100  
METAL STAIRS**

**PART 1 - GENERAL**

**401 SECTION INCLUDES**

- A. Stairs with concrete treads.
- B. Stairs with metal treads.
- C. Structural steel stair framing and supports.
- D. Handrails and guards associated with metal stairs.

**402 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Concrete: Concrete fill in stair pans and landings. Placement of metal anchors in concrete, and miscellaneous footings or slab thickening for stair columns.
- C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.
- D. Section 05 1200 - Structural Steel.
- E. Section 05 5000 - Metal Fabrications: Metal angles, and metal panel infill material.
- F. Section 05 5213 - Pipe and Tube Railings: Standard pipe and tube railings and balusters not specified with metal stairs.
- G. Section 05 7200 - Ornamental Handrails and Railings. Railing system other than standard pipe and tube railings.
- H. Section 09 6500 - Resilient Flooring: Treads for stairs.
- I. Section 09 9100 - Painting: Paint finish.

**403 REFERENCE STANDARDS**

- A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2022.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

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- J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.
  - K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
  - L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.
  - M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
  - N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
  - O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
  - P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
  - Q. SSPC-SP 2 - Hand Tool Cleaning; 2018.

#### **404 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
  - 2. Include the design engineer's seal and signature on each sheet of shop drawings.

#### **405 QUALITY ASSURANCE**

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the state in which the project is located, or personnel under direct supervision of such an engineer.

### **PART 2 - PRODUCTS**

#### **501 METAL STAIRS - GENERAL**

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
  - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
  - 2. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
  - 3. Dimensions: As indicated on drawings.
  - 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
  - 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
  - 6. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
  - 1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
    - a. Welded Joints: Continuously welded and ground smooth and flush.

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- b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
  - c. Exposed Edges and Corners: Eased to small uniform radius.
  - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
2. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
- a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
  - b. Welds Exposed to View: Ground smooth and flush.
  - c. Mechanical Joints: Butted tight, flush, and hairline.
  - d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
  - e. Exposed Edges and Corners: Eased to small uniform radius.
  - f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.
- E. Stair supplier shall provide and coordinate all means of attachments of stairs to walls, floors and ceilings.

**502 METAL STAIRS WITH CONCRETE TREADS**

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: As detailed. Same material and thickness as tread pans.
- C. Treads: field-installed concrete fill
  - 1. Metal pan with field-installed concrete fill.
    - a. Concrete Depth: 1-1/2 inches, minimum.
    - b. Concrete Strength: 3,000 psi at 28 days, minimum.
    - c. Air Content: 4 to 6 percent.
    - d. Concrete Reinforcement: 1/4" rebar, unless Drawings show otherwise.
    - e. Cement Color: As selected by Architect.
    - f. Aggregate Color: As selected by Architect.
  - 2. Precast Cement Terrazzo Tread: Cement Terrazzo Tread, on thinset setting bed, on steel pan.
    - a. Size and thickness: As detailed.
    - b. Compressive strength: 4,000 psi average.
    - c. Flexural strength: 600 psi average.
    - d. Reinforcement: 3/8" rebar.
    - e. Abrasive Strips: 1/2" abrasive inserts embedded into surface 1 inch back of nosing.
    - f. Color: As indicated or as selected.
    - g. Manufacturer:
      - 1) Wausau Tile.
      - 2) Substitutions: See Section 01 6000 - Product Requirements
  - 3. Tread Support: Sized to adequately support treads and live loads; welded or bolted to stringers.
  - 4. Tread Pan Material: Steel sheet.
  - 5. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
  - 6. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
  - 7. Concrete Reinforcement: 1/4" rebar, unless Drawings show otherwise.
- D. Treads: field-installed concrete fill

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1. Metal pan with field-installed concrete fill.
    - a. Concrete Depth: 1-1/2 inches, minimum.
    - b. Concrete Strength: 3,000 psi at 28 days, minimum.
    - c. Air Content: 4 to 6 percent.
    - d. Concrete Reinforcement: 1/4" rebar, unless Drawings show otherwise.
    - e. Cement Color: As selected by Architect.
    - f. Aggregate Color: As selected by Architect.
  2. Precast Cement Terrazzo Tread: Cement Terrazzo Tread, on thinset setting bed, on steel pan.
    - a. Size and thickness: As detailed.
    - b. Compressive strength: 4,000 psi average.
    - c. Flexural strength: 600 psi average.
    - d. Reinforcement: 3/8" rebar.
    - e. Abrasive Strips: 1/2" abrasive inserts embedded into surface 1 inch back of nosing.
    - f. Color: As indicated or as selected.
    - g. Manufacturer:
      - 1) Wausau Tile.
      - 2) Substitutions: See Section 01 6000 - Product Requirements
  3. Tread Support: Sized to adequately support treads and live loads; welded or bolted to stringers.
  4. Tread Pan Material: Steel sheet.
  5. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
  6. Concrete Reinforcement: Welded wire mesh.
- E. Risers: Same material and thickness as tread pans.
- F. Stringers: As detailed on drawings.
  1. Stringer Depth: As indicated on drawings.
  2. End Closure: Sheet steel of same thickness as risers welded across ends.
- G. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
- H. Railings: Steel pipe railings unless indicated otherwise.
- I. Finish: Shop- or factory-prime painted.
- J. Under Side of Stair: Exposed-to-view; to be finished same as specified for other exposed-to-view surfaces.

### **503 METAL STAIRS WITH METAL TREADS**

- A. Jointing and Finish Quality Level: Commercial, as defined above.
- B. Risers: As detailed on drawings.
- C. Treads: Steel plate with abrasive coating.
  1. Tread Thickness: 1/4 inch, minimum.
  2. Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.
- D. Stringers: Rolled steel channels.
  1. Stringer Depth: 11 inches.
  2. End Closure: Sheet steel of same thickness as risers welded across ends.
- E. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
- F. Railings: Steel pipe railings unless indicated otherwise.
- G. Finish: Galvanized after fabrication, except sheet components are to be galvanized before fabrication.

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- H. Footings of exterior stairs shall be designed by stair manufacturer.

**504 HANDRAILS AND GUARDS**

- A. Wall-Mounted Rails: Steel fabrications, as detailed.
- B. Guards:
1. Top Rails: Steel fabrications, as detailed.
  2. Bottom Rails: Steel fabrications as detailed.
  3. Infill: As indicated.
  4. End and Intermediate Posts: Same material and size as top rails, unless detailed otherwise.
    - a. Horizontal Spacing: As indicated on drawings.
    - b. Mounting: Welded to top surface of stringer, unless detailed otherwise.

**505 MATERIALS**

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, galvanized finish. (For locations exposed to exterior.)
- D. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- E. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, transparent finish on steel, unless shown to be otherwise.
- F. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
  1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
  2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- G. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.
- H. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.
- I. Concrete Reinforcement: Mesh type as detailed, galvanized.

**506 ACCESSORIES**

- A. Factory Fabricated Stair Tread and Nosing:
1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
    - a. Tread Abrasive Filler: Virgin grain aluminum oxide and/or silicon carbide epoxy-bonded to tread base.
    - b. Tread Type: Ribbed bar.
    - c. Nosing Types: Long nose for steel pan stairs.
    - d. Color: Black.
  2. Manufacturers:
    - a. Nystrom, Inc: [www.nystrom.com/sle](http://www.nystrom.com/sle).
    - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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- D. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.
  - E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

**5.07 SHOP FINISHING**

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
  - 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
  - 2. Number of Coats: One.
- D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A 123/A 123M. (For locations exposed to exterior.)
  - 1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

**5.08 FINISHES**

- A. Interior Stairs: Shop primed, for Paint Finish.
  - 1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.
- B. Exterior Stairs: Shop galvanized, for Paint Finish:
  - 1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.
- C. Wet Powder Coat: Wet electrostatic, field-applied, powder-coat finish.
  - 1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.
  - 2. Color: As selected from manufacturer's standard finishes.

**PART 3 - EXECUTION**

**6.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

**6.02 PREPARATION**

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

**6.03 INSTALLATION**

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Install manufactured items in accordance with manufacturer's directions. Comply with governing regulations, and industry standards applicable to the work.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.

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- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete or surfaces noted to remain transparent finish on steel.

**604 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.  
B. Maximum Offset From True Alignment: 1/4 inch.

**END OF SECTION**



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**SECTION 05 5133  
METAL LADDERS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Shop-fabricated metal ladders.

**102 RELATED REQUIREMENTS**

- A. Section 05 5100 - Metal Stairs.
- B. Section 05 5213 - Pipe and Tube Railings.
- C. Section 09 9113 - Exterior Painting: Paint finish.

**103 REFERENCE STANDARDS**

- A. 29 CFR 1910.23 - Ladders; Current Edition.
- B. 29 CFR 1926.1053 - Ladders; Current Edition.
- C. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- M. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:

- 
1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
  - D. Designer's Qualification Statement.

**105 QUALITY ASSURANCE**

- A. Design\_\_\_\_\_under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

**PART 2 PRODUCTS**

**201 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

**202 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by intermittent welds and plastic filler.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

**203 FABRICATED LADDERS**

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
  1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
  2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
  3. Space rungs 7 inches from wall surface.

**204 FINISHES - STEEL**

- A. Prime paint steel items.
  1. Do not prime surfaces in direct contact with concrete.
  2. Do not prime surfaces where field welding is required.

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- B. Prime Painting: Two coats.
  - C. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

**205 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

**302 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

**303 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

**304 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

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**SECTION 05 5213  
PIPE AND TUBE RAILINGS**

**PART 1 - GENERAL**

**401 SECTION INCLUDES**

- A. Wall-mounted railings.
- B. Handrailings not specified with stairs.
- C. Free-standing railings at ramps, steps, or as noted.

**402 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01 2300 - Alternates.
- C. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- D. Section 04 2000 - Unit Masonry: Placement of anchors in masonry.
- E. Section 05 5000 - Metal Fabrications: Metal angles, and metal panel infill material.
- F. Section 05 5100 - Metal Stairs: Handrails specified with metal stairs.
- G. Section 05 7200 - Ornamental Railings: Railing system other than standard pipe and tube railings.
- H. Section 09 9100 - Painting: Paint finish.

**403 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.
- F. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- G. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012.
- H. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.
- I. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.
- J. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.
- K. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications; 2021.
- L. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

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- M. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
  - N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
  - O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

**404 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product specifications and installation instructions for products and processes used in handrails and railings, including finishes and grout.
- C. Shop Drawings shall indicate loading requirements as specified herein and be certified, sealed, and signed by a Registered Structural Engineer in the State in which the Project is located, to be in conformance with all requirements as specified herein and in accordance with all State and local codes and regulations.
  - 1. Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
  - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
  - 3. Include the design engineer's stamp or seal on each sheet of shop drawings.
- D. Samples: Submit samples for each type of metal finish indicated. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, provide "range" samples showing limits of such variations.
  - 1. Include samples of fittings and brackets proposed for use.
  - 2. Include sample of typical welded connection.
- E. Samples: Submit two, 12 inch long samples of each type of handrail. Submit two samples of elbow, Tee, wall bracket, escutcheon, and end stop.

**405 QUALITY ASSURANCE**

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Design-Builder, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
- C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

**406 DELIVERY, STORAGE, AND HANDLING**

- A. Store handrails and railing systems in clean, dry location away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof tarpaulin or polyethylene sheeting; allow for air circulation inside the covering.
- B. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and minimum requirements regarding stored materials.

**PART 2 - PRODUCTS**

**501 RAILINGS - GENERAL REQUIREMENTS**

- A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress

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in each respective component of each metal fabrication.

1. Top Rail or Guard Rail: Design to be capable of withstanding the following loads:
    - a. Concentrated load of 200 pounds applied at any point non-concurrently, vertically downward, or horizontally.
    - b. Uniform load of 50 pounds per lineal foot applied non-concurrently, vertically downward, or horizontally.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  2. Handrails Not Serving as Top Rails or Guard Rails: Design to be capable of withstanding the following loads:
    - a. Concentrated load of 200 pounds applied at any point non-concurrently, vertically downward, or horizontally.
    - b. Uniform load of 50 pounds per lineal foot applied non-concurrently, vertically downward, or horizontally.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  3. Infill Area of Handrail and Screenwall System: Capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system including panels, intermediate rail balusters, or other elements composing the infill area.
    - a. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guardrails.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
- D. Dimensions: See drawings for configurations and heights.
1. Top Rail: Profile, as detailed.
  2. Bottom Rail: Profile, as detailed.
  3. Posts: Profile as detailed.
  4. Balusters: As detailed.
  5. Infill: As detailed.
  6. Drink rail: Aluminum shelf as detailed. Mount rail per manufacturer recommendations.
  7. Pickets:
    - a. Horizontal Spacing: Maximum 4 inches on center, unless shown otherwise.
    - b. Top Mounting: Welded to underside of top rail.
    - c. Bottom Mounting: Welded to bottom rail, unless otherwise indicated on drawings.
- E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.
- F. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

## **502 STEEL RAILING SYSTEM**

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A 53/A 53M Grade B Schedule 40, galvanized finish.
- C. Wall-Mounted Rails: Steel fabrications, as detailed.



- D. Top Rail: Steel fabrications, as detailed.
- E. Bottom Rail: Steel fabrications, as detailed.
- F. Infill: Metal panel infill material.
- G. Posts: As detailed.
- H. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- I. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
- J. Straight Splice Connectors: Steel concealed spigots.
- K. Galvanizing: In accordance with requirements of ASTM A123/A123M.
  - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.
- L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

**503 MISCELLANEOUS MATERIALS**

- A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.
- C. Fasteners:
  - 1. Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
  - 2. Provide concealed fasteners for interconnection of handrail and railing components where welding is not feasible and for their attachment to other work, except where otherwise indicated.
- D. Anchors and Inserts: Provide anchors of proper type, size, and material for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

**504 FABRICATION**

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  - 1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
  - 2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

**505 FINISHES**

- A. Interior Railings: Shop primed, for Paint Finish:

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1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.
  - B. Exterior Railings: Shop galvanized, for Paint Finish:
    1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.
  - C. Repair galvanized coatings with galvanizing repair paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with Military Specification MIL-P-21035 (Ships) or SSPC Paint 20.
  - D. Intermediate Coat: One coat of the following, shop applied Tnemec "Series 66 HI-BUILD EPOXOLINE".
  - E. Finish Coats: See Section 09 9100 - PAINTING.

**PART 3 - EXECUTION**

**601 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

**602 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.
- C. Take field measurements prior to fabrication.

**603 INSTALLATION**

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Perform cutting, drilling and fitting required for installation of handrails and railings. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
- C. Install in accordance with manufacturer's instructions.
- D. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- E. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- F. Anchor railings securely to structure.
- G. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
  1. Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth, fill, sand, apply cold-process galvanizing repair paint, and touch-up shop paint coat.
- H. Conceal anchor bolts and screws whenever possible.
- I. Adjust handrails and railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by design loadings.

**604 ANCHORING POSTS**

- A. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.
- B. Anchor posts in concrete and stone by core drilling holes not less than 5" deep (excluding depth of stone veneer), and 3/4" greater than outside dimensions of posts. Clean holes of all loose material, insert posts

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and fill annular space between post and concrete with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.

1. Seal around rail penetration with pourable sealer, as specified in Section 07900 - Joint Sealers.
2. Cover anchorage joint with flange or escutcheon plate attached to post after filling of annular space.

**605 RAILING CONNECTIONS**

- A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100-percent contact or use manufacturer's standard fittings designed for this purpose.

**606 ANCHORING RAILING ENDS**

- A. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.
- B. Anchor railing ends to metal surfaces by welding using manufacturer's standard concealed fittings, unless otherwise indicated.
- C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip-joint internal sleeve, extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

**607 ATTACHMENT OF HANDRAILS TO WALLS**

- A. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.
- B. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.
- C. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.
- D. For stud partitions, use lag bolts fastened to 2 x 12 treated wood blocking between studs. Coordinate with spacing of studs for accurate location of blocking members.

**608 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**609 PROTECTION**

- A. Protect finishes of railings and handrails from damage during construction period by use of temporary protection coverings approved by railing manufacturer. Remove protective covering at project completion or when directed by Architect.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.
- C. Remove all burrs and uneven surfaces, fill gaps, and insure a smooth rail.

**END OF SECTION**

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**SECTION 05 7200  
ORNAMENTAL HANDRAILS AND RAILINGS**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Railing and guardrail assemblies.

**1.02 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 05 5000 - Metal Fabrications: Supports.
- C. Section 05 5213 - Pipe and Tube Railings: Other handrails not specified with stairs.

**1.03 REFERENCE STANDARDS**

- A. ASTM A555/A555M - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods; 2005 (Reapproved 2009).
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- C. ASTM B138/B138M - Standard Specification for Manganese Bronze Rod, Bar, and Shapes; 2011.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2012.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- F. AWS C 3.4/C3.4M - Specification for Torch Brazing; 2007.
- G. AWS C 3.5/C 3.5M - Specification for Induction Brazing; 2007.
- H. AWS C 3.9/C 3.9M - Specification for Resistance Brazing; 2009.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2010.
- J. AWS D1.6 - Structural Welding Code - Stainless Steel; 1999.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
  - 1. Contractor.
  - 2. Manufacturer's representative.
  - 3. Architect.
  - 4. Owner's representative.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
  - 1. Shop drawings shall be sealed, signed, and certified by a Registered Structural Engineer in the State in which the Project is located, to be in conformance with all requirements specified herein, and in

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conformance with all State and local codes and regulations.

- a. Include the design engineer's stamp or seal on each sheet of shop drawings.
- D. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- E. Manufacturer's Installation Instructions.
- F. Maintenance Data: Manufacturer's instructions for care and cleaning.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**106 QUALITY ASSURANCE**

- A. Installer Qualifications: Company having performed at least 3 installations of comparable quality and size within last 3 years, and acceptable to manufacturer.
- B. Mock-ups: Construct a railing of each type specified. Locate mock-ups where directed.

**107 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver railing materials in factory provided protective coverings and packaging.
- B. Protect railing materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect railing materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D. Prior to installation, store materials and components under cover, in a dry location.

**108 FIELD CONDITIONS**

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.

**109 WARRANTY**

- A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Decorative Metal Railings:
  - 1. Viva Railings, LLC: 151 W. Vista Ridge Mall Drive, Lewisville, TX 75067. 972-353-8482. [www.vivarailings.com/#sle](http://www.vivarailings.com/#sle).(BASIS OF DESIGN)
  - 2. J.M. Gruca, Inc.; Atlas system (post type): [www.architecturalglassrailings.com](http://www.architecturalglassrailings.com).
  - 3. Hollaender Manufacturing Co; Interna-Rail railing system: [www.hollaender.com](http://www.hollaender.com).

**202 RAILING SYSTEMS**

- A. Railings - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
  - 1. Design Criteria: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
    - a. Lateral Force: 75 lb minimum, at any point, when tested in accordance with ASTM E935.
    - b. Distributed Load: 50 pounds per foot minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
    - c. Concentrated Loads on Intermediate Rails: 50 pounds per square ft, minimum.

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- d. Concentrated Load: 200 pounds minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
  2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
  3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
  4. Field Connections: Provide sleeves to accommodate site assembly and installation.
  5. Welded and Brazed Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
    - a. Ease exposed edges to small uniform radius.
    - b. Welded Joints:
      - 1) Carbon Steel: Perform welding in accordance with AWS D 1.1/D 1.1M.
      - 2) Stainless Steel: Perform welding in accordance with AWS D 1.6.
    - c. Brass/Bronze Brazed Joints:
      - 1) Perform torch brazing in accordance with AWS C3.4/3.4M.
      - 2) Perform induction brazing in accordance with AWS C3.5/3.5M.
      - 3) Perform resistance brazing in accordance with AWS C3.9/3.9M
- B. Post Railing System: Engineered, free-standing, post supported railing system.
1. Posts: Round, steel, 1-1/2 inch.
  2. Handrail Brackets: Same metal as railing.
  3. Powder Coat Finish, Exposed Surfaces: \_\_\_\_\_.
- C. Cable Railing System:
1. Description: Post and cable railing system.
  2. Stainless Steel Tube: Type 304 stainless steel.
    - a. Guardrail Post: 2 inch outside diameter.
    - b. Handrail: 1-1/2 inch outside diameter.
    - c. Top Rail: 1-1/2 inch outside diameter.
  3. Cable: ASTM A555/555M.
    - a. Fabricate from ASTM A666 stainless steel, Type 304.
    - b. Size: 3/16 inch diameter.
  4. Fittings: Type 304 stainless steel, non-swedge.
  5. Fasteners: Stainless steel.
  6. Infill: Metal. Size and design to match Architect's specifications.

## **203 MATERIALS**

- A. Materials: As detailed, and as described below.
- B. Stainless Steel Components:
  1. ASTM A666, Type 304.
  2. Stainless Steel Finish: No. 4 Satin.

## **204 ACCESSORIES**

- A. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- B. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
  1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
  2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
  3. For anchorage to stud walls, provide backing plates for bolting anchors.

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4. Exposed Fasteners: No exposed bolts or screws.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

**302 PREPARATION**

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.
- C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

**303 INSTALLATION**

- A. Comply with manufacturer's drawings and written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

**304 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**305 CLEANING**

- A. Remove protective film from exposed metal surfaces.
- B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.
- C. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances.

**306 PROTECTION**

- A. Protect installed components and finishes from damage after installation.
- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
  - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

**END OF SECTION**

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**SECTION 06 1000  
ROUGH CARPENTRY**

**PART 1 - GENERAL**

**401 SECTION INCLUDES**

- A. Roof sheathing.
- B. Roof-mounted curbs.
- C. Roofing nailers.
- D. Roofing cant strips.
- E. Preservative treated wood materials.
- F. Fire retardant treated wood materials.
- G. Communications and electrical room mounting boards.
- H. Concealed wood blocking, nailers, and supports.
- I. Miscellaneous wood nailers, furring, and grounds.

**402 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
- C. Section 05 3100 - Steel Deck.
- D. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- E. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings, and self-adhered membrane flashing over sheathing.

**403 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).
- D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- E. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2018.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.
- H. PS 1 - Structural Plywood; 2019.
- I. PS 20 - American Softwood Lumber Standard; 2021.
- J. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; 2019.



- K. SPIB (GR) - Standard Grading Rules; 2021.
- L. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.
- M. WWPA G-5 - Western Lumber Grading Rules; 2021.

**404 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- D. Submit proposed screw pattern layout for roof sheathing attachment, such that designed roof system meets FM 1-120 Wind Uplift Requirements.
- E. Submit data sheets and samples of all fasteners.

**405 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

**PART 2 - PRODUCTS**

**501 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Southern Pine, unless otherwise indicated.
  - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
  - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at [www.alsc.org](http://www.alsc.org), and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

**502 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. Northeastern Lumber Manufacturer's Association (NeLMA).
  - 2. National Lumber Grades Authority (NLGA).
  - 3. Redwood Inspection Service (RIS).
  - 4. Southern Pine Inspection Bureau (SPIB).
  - 5. West Coast Lumber Inspection Bureau (WCLIB).
  - 6. Western Wood Products Association (WWPA).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

**503 EXPOSED BOARDS**

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

- B. Moisture Content: Kiln-dry (15 percent maximum).
- C. Surfacing: S4S.
- D. Species: Southern Pine.
- E. Grade: No. 2, 2 Common, or Construction.

**504 CONSTRUCTION PANELS**

- A. Roof Sheathing: Fiberglass mat faced gypsum panel, with water resistant gypsum core. ASTM C1177/C1177M, square long edges, 5/8 inch Type X fire-resistant, unless otherwise indicated.
  - 1. GAF; Dens-Deck Prime Roof Board: [www.gaf.com](http://www.gaf.com).
  - 2. Georgia-Pacific Gypsum LLC; DensDeck Prime Roof Board: [www.densdeck.com](http://www.densdeck.com).
  - 3. USG; Securock: [www.usg.com](http://www.usg.com)
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Sheathing: Glass mat faced gypsum with integral water-resistive and air barrier, ASTM C1177/C1177M, 5/8 inch thick.
  - 1. Edges: Square.
  - 2. Water Vapor Permeance: 1 perm, minimum, when tested in accordance with ASTM E96/E96M.
  - 3. Air Permeance, Sheathing: 0.001 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
  - 4. Air Permeance, Assembly: 0.04 cfm/sq ft, maximum, when tested in accordance with ASTM E2357.
  - 5. Warranty:
    - a. Exposure: Manufacturer's standard; 12 months, against exposure damage, and dated from installation of product.
    - b. Defect: Manufacturer's standard; 5 years, against manufacturing defects, and dated from purchase of product.
    - c. Material: Manufacturer's standard; 5 years, dated from Date of Substantial Completion.
    - d. Effective Drainage Warranty: 12 years, dated from installation of product, when sheathing is used as substrate under approved, water-managed exterior insulation finish system (EIFS).
  - 6. Products:
    - a. Georgia-Pacific LLC; DensElement Barrier System: [www.DensElement.com/#sle](http://www.DensElement.com/#sle).
    - b. Tremco Commercial Sealants & Waterproofing; Securock ExoAir 430 Panel: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
    - c. USG Corporation; Securock ExoAir 430 Panel 5/8 in. (15.9 mm): [www.usg.com/#sle](http://www.usg.com/#sle).
- C. Communications and Electrical Room Mounting Boards: UL verified fire retardant backboard: A-C plywood; 3/4 inch thick; Coated with UL Classified Fire Retardant Latex (Class "A" Rated). Tested to UL723 (ASTM E84) standards. Color: As selected by Architect from manufacturer's standard colors.
  - 1. Pre-Manufactured Product:
    - a. WoodBacker "Fire Retardant Backboards"; [Basis of Design]: [www.woodbacker.com](http://www.woodbacker.com).
    - b. U-TECK; Fire Retardant Backboard: [www.uteck.com](http://www.uteck.com)
    - c. Readyspec Backboards, Inc; Fire Retardant Backboard: [www.pathways-spaces.com/](http://www.pathways-spaces.com/)
    - d. Substitutions: See Section 01 6000 - Product Requirements.

**505 ACCESSORIES**

- A. Fasteners and Anchors:
  - 1. Metal and Finish: AISI Type 304 or 316 Stainless steel for fire-retardant wood and preservative-treated wood locations; hot-dipped galvanized steel per ASTM A 153/ A 153M for rough carpentry exposed to weather, in ground contact, or area of high relative humidity; unfinished steel

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- elsewhere. Acceptable to manufacturer of wood treatment materials and manufacturer of fasteners.
2. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Metal Framing Anchors:
1. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
    - a. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
    - b. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
  2. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G90 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.
    - a. Use galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and all other locations, and at every point of bearing.
    - b. Minimum Thickness: 18-gauge.
- C. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Nails, Wire, and Brads: FS FF-N-105.
- E. Power Driven Fasteners (screws): National Evaluation Report NER-272.
- F. Wood Screws: ANSI B18.6.1.
- G. Lag Bolts: ANSI B18.2.1.
- H. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.
- I. Anchors shall be manufactured by American manufacturer.

**506 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
  2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Fire Retardant Treatment:
1. Exterior Type: AWWA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.

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- a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
  - b. Do not use treated wood in direct contact with the ground.
  2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    - b. All interior rough carpentry items in buildings of Type I or Type II construction are to be fire retardant treated.
    - c. All concealed wood blocking, framing and sheathing in buildings of Type I or Type II construction shall be fire retardant treated.
    - d. Review Life Safety Sheets and provide fire retardant treated wood blocking in all rated walls.
    - e. Do not use treated wood in applications exposed to weather or where the wood may become wet.
  - C. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      - a. Treat lumber exposed to weather.
    2. Treat lumber in contact with roofing, flashing, or waterproofing.
    3. Treat lumber in contact with masonry or concrete.
    4. Treat lumber less than 18 inches above grade.
      - a. Treat lumber in other locations as indicated.
    5. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
      - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
      - b. Treat plywood in contact with roofing, flashing, or waterproofing.
      - c. Treat plywood in contact with masonry or concrete.
      - d. Treat plywood less than 18 inches above grade.
      - e. Treat plywood in other locations as indicated.
  - D. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
    1. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
    2. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

### **PART 3 - EXECUTION**

#### **601 PREPARATION**

- A. Coordinate installation of rough carpentry members specified in other sections.

#### **602 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

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**603 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
  - 1. Cabinets and shelf supports.
  - 2. Lab casework.
  - 3. Wall brackets.
  - 4. Handrails.
  - 5. Grab bars.
  - 6. Towel and bath accessories.
  - 7. Wall-mounted door stops.
  - 8. Chalkboards and marker boards.
  - 9. Wall paneling and trim.
  - 10. Joints of rigid wall coverings that occur between studs.

**604 ROOF-RELATED CARPENTRY**

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

**605 INSTALLATION OF CONSTRUCTION PANELS**

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
  - 1. At long edges use sheathing clips where joints occur between roof framing members, unless tongue and groove sheathing is used.
  - 2. Provide sheathing clips at all unsupported edges.
  - 3. Screw panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
- C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
  - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
  - 3. Install adjacent boards without gaps.
  - 4. Size and Location: As indicated on drawings.

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**606 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

**607 CLEANING**

- A. Waste Disposal: Comply with the requirements of Section 01 5000.
  - 1. Comply with applicable regulations.
  - 2. Do not burn scrap on project site.
  - 3. Do not burn scraps that have been pressure treated.
  - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION**

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**SECTION 06 2000  
FINISH CARPENTRY**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Finish carpentry items.
- B. Wood casings and moldings.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 06 4000 - Architectural Woodwork: Wood frames, countertops, etc.
- D. Section 09 9100 - Painting: Paint finish.

**103 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2020.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- E. WI (CCP) - Certified Compliance Program (CCP); Current Edition.
- F. WI (MCP) - Monitored Compliance Program (MCP); Current Edition.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Provide instructions for attachment hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
- D. Samples: Submit one sample of lumber or finish plywood, 12 by 12 inch in size, and two samples 3 by 3 inch in size, illustrating wood grain and specified finish.
- E. Samples: Submit two samples of wood trim 6 inch long.

**105 QUALITY ASSURANCE**

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Premium grade.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

**106 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire retardant requirements.

**107 DELIVERY, STORAGE, AND HANDLING**

- A. Protect from moisture damage.



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**108 PROJECT CONDITIONS**

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

**PART 2 - PRODUCTS**

**201 MATERIALS - GENERAL**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Quality Standards Illustrated for Premium Grade.

**202 SUSTAINABILITY CHARACTERISTICS**

**203 LUMBER MATERIALS**

- A. Softwood Lumber: SYP species, maximum moisture content of 6 percent of quality suitable for transparent finish.
- B. Hardwood Lumber: white or yellow poplar species (coordinate with other wood trim), maximum moisture content of 6 percent, of quality suitable for transparent finish.

**204 SHEET MATERIALS**

- A. Softwood Plywood: PS 1 Grade A-B; Veneer core; SYP face species, (or similar species permitted by reference standards).
- B. Hardwood Plywood: HPVA HP-1, Grade AA, Type I at exterior, Type II at Interior; Veneer core, type of glue recommended for application; Natural Birch face species, Rotary cut.

**205 PLASTIC LAMINATE MATERIALS**

- A. Plastic Laminate: See Finish Legend.

**206 ADHESIVE**

- A. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

**207 FASTENINGS**

- A. Fasteners: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.
- B. Concealed Joint Fasteners: Threaded steel.

**208 ACCESSORIES**

- A. Lumber for Shimming, Blocking: Softwood lumber of SYP species.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

**209 FABRICATION**

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints

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minimum 2 feet from sink cut-outs.

**2.10 SHOP FINISHING**

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
  - 1. Transparent:
    - a. System - 1, Lacquer, Nitrocellulose.
    - b. Stain: As selected by Architect.
    - c. Sheen: Flat.
  - 2. Opaque:
    - a. System - 1, Lacquer, Nitrocellulose.
    - b. Color: As selected by Architect.
    - c. Sheen: Flat.
- E. Prime paint surfaces in contact with cementitious materials.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.
- B. Verify wall surface is free of bows, humps, and other deficiencies that will be emphasized by the trim work. Report these issues to the Prime Contractor.

**3.02 INSTALLATION**

- A. Set and secure materials and components in place, plumb and level.
- B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- C. Install interior trim with wall adhesive by gun application. Install exterior trim and components with hot-dipped galvanized or stainless steel nails at 12" o.c., unless recommended otherwise by manufacturer.
- D. Match grains and color so that individual pieces do not stand out.

**3.03 PREPARATION FOR SITE FINISHING**

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 9100 - Painting.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

**3.04 TOLERANCES**

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION**

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**SECTION 06 4000  
ARCHITECTURAL WOODWORK**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Laminate clad countertops.
- B. Laminate covered cabinets.
- C. Wood cabinets, desks, and paneling.
- D. Solid surface countertops, backsplashes and trim, where indicated; and vertical panels, where indicated.
- E. Manufactured quartz solid surface countertop, backsplashes and trim, where indicated; and vertical panels, where indicated.
- F. Closet and utility shelving (paint on site, under Section 09 9100).
- G. Wood frames, sidelights, panels, base, window sills, and miscellaneous trim (paint on site, under Section 09 9100), stained (transparent finish) or painted (opaque finish) where indicated.
- H. Hardware for architectural woodwork.
- I. Related work and trim for above items.
- J. Extent of each type of architectural woodwork is indicated on drawings and in schedules.
- K. Architectural woodwork and components for opaque finish are intended to be finish painted on-site, under Section 09 9100.
- L. Architectural woodwork and components for natural, stained and/or transparent finish are intended to be painted in woodwork fabricator's shop under controlled conditions, under the work of this Section.

**1.02 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Related work specified elsewhere includes:
  - 1. Section 06 1000 - Rough Carpentry.
  - 2. Section 06 2000 - Finish Carpentry.
  - 3. Section 07 9005 - Joint Sealers.
  - 4. Section 08 1416 - Flush Wood Doors.
  - 5. Section 09 9100 - Painting.
  - 6. Section 12 3219 - Laminate Casework.

**1.03 SUBMITTALS:**

- A. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices, blocking requirements and other components.
  - 1. Manufacturer's current and complete product data, for manufactured units of work, including color selection data, samples, and anchorage systems.
- B. Samples: Submit the following samples:
  - 1. Lumber and panel products with or for transparent finish; 6-inches x 3/4-inch x 18-inches, for each species and cut, finished on 1-side and 1-edge. Also submit two 3 by 3 inch samples with finish on 1-side.
  - 2. Cabinet Hardware: One unit of each type and finish, which will be returned for use on the project, upon request by the Contractor.

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3. Quartz Solid Surface: Manufacturer's standard samples, approximately 6-inches x 6-inches with finish as required for this project, and representative color range anticipated.
  4. Solid Surfacing and Plastic Laminate Products: Manufacturer's standard samples, approximately 4-inches x 6-inches, with finish as required for this project, and representative color range anticipated.

**104 QUALITY ASSURANCE:**

- A. AWS: Comply with applicable requirements of "Architectural Woodwork Standards" published by the Architectural Woodwork Standards.
- B. Fabricator Qualifications: Fabricators shall be experienced firms specializing in the types of architectural woodwork required for this project for at least 5-verifiable years and on at least 10-verifiable projects of similar size, scope, complexity, and quality as this project.
  1. Quartz Fabricator: 5-years and 10-verifiable projects.
  2. Solid Surfacing Fabricator: 5-years and 10-verifiable projects.
- C. Installer Qualifications: Arrange for installation of architectural woodwork by the fabricator, or by a firm under the control and direction of the fabricator, which can demonstrate at least 5-verifiable years successful experience in installing architectural woodwork items on at least 5-verifiable projects, similar in type and quality to those required for this project.

**105 DELIVERY, STORAGE, AND HANDLING:**

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

**106 PROJECT CONDITIONS:**

- A. Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0-percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity conditions.

**PART 2 - PRODUCTS**

**201 ACCEPTABLE MANUFACTURERS:**

- A. Laminate Clad and Wood Cabinet Manufacturers: Subject to compliance with requirements, provide premium grade, custom made cabinets and woodwork from a millwork shop complying with requirements of "Quality Assurance" article above.
- B. Plastic Laminate Manufacturer: See Finish Legend for Manufacturers and colors.
- C. Quartz-Surfacing Material: Subject to compliance with requirements, provide quartz countertop material of one the following. Color and finish indicated in drawings:
  1. Cambria: [www.cambriaUSA.com](http://www.cambriaUSA.com).
  2. CaesarStone: [www.caesarstoneUS.com](http://www.caesarstoneUS.com).
  3. Daltile: [www.daltile.com](http://www.daltile.com).

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4. Silestone: [www.silestoneusa.com](http://www.silestoneusa.com).
  5. Substitutions: See Section 01 6000 - Product Requirements.
- D. Solid-Surfacing Material/Manufacturer: Homogeneous solid sheets of cast, filled acrylic resin complying with material and performance requirements in ANSI Z124.3, for Type 6.
1. Standard full product line of "Corian" as manufactured by DuPont.
  2. Avonite: [www.avonitesurfaces.com](http://www.avonitesurfaces.com).
  3. Formica: [www.formica.com](http://www.formica.com).
  4. Hi Macs: [www.lghimacs.com](http://www.lghimacs.com).
  5. Wilsonart: [www.wilsonart.com](http://www.wilsonart.com). (Basis of Design, Quality and Warranty)

**202 FABRICATION, GENERAL:**

- A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.
- B. Fabricate woodwork to dimensions, profiles, and details indicated with dowel, dado, glue and screw construction, with openings and mortises precut, where possible, to receive hardware and other items and work.
  1. Ease edges to a 1/16-inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1-inch in nominal thickness, 1/8-inch radius for edges of rails and similar members over 1-inch in nominal thickness.
- C. Complete fabrication, assembly, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.
- E. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit. A tight fit of less than 1/8-inch is expected.
- F. Products in this Section shall be constructed only of materials that are formaldehyde-free.

**203 FIRE-RETARDANT MATERIALS:**

- A. Where fire-retardant treated lumber is indicated, provide materials which are pressure impregnated with fire-retardant chemicals and comply with the following requirements:
  1. As required to comply with referenced standards and finish classifications necessary as per the Standard Building Code, NFPA 101 - Life Safety Code, authorities having jurisdiction, and acceptable in all respects for indoor use and finish requirements.
  2. Fire-Retardant Chemicals: Use chemicals of type and for applications indicated which do not bleed-through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.
- B. Fire Performance Characteristics: Provide materials which are identical to those tested per ASTM methods and time periods indicated, are marked and listed for fire performance characteristics by Underwriters Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction, and comply with the following requirements:
  1. Mill lumber after treatment, within limits set for wood removal which does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting agency.

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- C. Marking: Identify treated lumber with separable paper classification marking of inspecting and testing agency, unless otherwise indicated.
  - D. Surface Burning Characteristics: Not exceeding values required by latest edition of the "Standard Building Code" and "NFPA 101" (with amendments), tested per ASTM E 84 for standard time period.
    - 1. Flame Spread: Per Code.
    - 2. Smoke Developed: Per Code.
  - E. Kiln-dry woodwork after treatment to levels required for non-fire-retardant treated woodwork materials. Maintain moisture content required by kiln drying, before and after treatment.
    - 1. Discard treated lumber which does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

**204 STANDING AND RUNNING TRIM:**

- A. Quality Standard: Comply with AWS Section 6 - Interior Millwork.
- B. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.
- C. Assemble Casings in plant except where limitations of access to place of installation require field assembly.
- D. Interior Trim for Transparent Finish (typical finish unless specifically indicated otherwise): Comply with the following requirements:
  - 1. Grade: Premium, Grade I.
  - 2. Lumber Species: Match wood doors.
  - 3. Cut: Plain Sliced.
  - 4. Locations: Provide stained transparent finish within rooms which have new woodwork with transparent finish, at indicated areas. Refer to Elevations.
- E. Interior Trim for Opaque Finish (only where specifically indicated, if any): Comply with the following requirements:
  - 1. Grade: Custom. Grade II.
  - 2. Lumber Species: Any closed-grain hardwood listed in referenced woodworking standard.
  - 3. Cut: Plain or Rotary cut.
  - 4. Locations: Provide opaque finish within rooms which have new woodwork with opaque finish, unless indicated otherwise. Refer to Elevations and Finish Legend.

**205 ARCHITECTURAL COUNTER TOPS:**

- A. Quality Standard: Comply with AWS, Edition 2 - Section 11-Countertops.
- B. Type of Top - Laminate Clad:
  - 1. Grade: Premium; Grade I.
  - 2. Edge Treatment: Refer to Drawings.
  - 3. Core: Minimum 47-lb. density particle board, except at least 3/4-inch A-B plywood with exterior glue (approved for interior use), at tops with sinks and/or plumbing fixtures.
  - 4. Minimum Thickness: 1-1/4-inches at tops and 3/4-inch at splashes, unless indicated otherwise on the Drawings.
- C. Type of Top - Quartz: Homogeneous mixture containing 93% pure quartz with additions of high performance polyester resin, pigments and special effects.
  - 1. Performance:
    - a. Moisture Absorption: typical results 0.02%; ASTM C97.
    - b. Modulus of Rupture: typical results 6,800 psi; ASTM C99.

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- c. Compressive Strength: typical results 24,750 psi; ASTM C170.
  - d. Abrasion Resistance: typical results 223; ASTM C501.
  - e. Bond Strength: typical results 205 psi; ASTM C482.
  - f. Thermal Shock: passes 5 cycles: ASTM 484.
  - g. Breaking Strength of Tile: typical results 3,661 lbf; ASTM C648.
  - h. Coefficient of Friction Pull Method: 75 avg. dry/ .55 avg. wet; ASTM C1028.
  - i. Surface Burning Characteristics: typical results 17; ASTM E84.
  - j. Smoke Density: flaming 196, non-flaming 69; ASTM E662.
  - k. Stain Resistance: Unaffected; ANSI Z124.6.
2. Accessories:
    - a. Mounting Adhesive: Structural grade 50-year silicone or epoxy adhesive.
    - b. Quartz Surface Adhesive: Epoxy or polyester adhesive of type recommended by manufacturer for application and conditions of use. (Adhesive which will be visible in finished work shall be tinted to match quartz surface.)
    - c. Sealant: Clear sealant of type recommended by manufacturer for application and use. Provide anti-bacterial type in toilet, bath, or kitchen areas. (Sealants specified in Section 07 9005 - Joint Sealers).
    - d. Solvent: Denatured alcohol for cleaning quartz surfacing to assure adhesion of adhesives and sealants.
    - e. Cleaning Agents: Mild soap and water.
  3. Edge Treatment: As indicated on Drawings.
  4. Laminations:
    - a. Laminate layers of quartz surfacing as required to create required thicknesses following procedures recommended by the manufacturer.
  5. Pattern, Color, and Finish: See Finish Legend.
  6. Thickness: 1 cm for vertical surfaces; 2 cm for horizontal surfaces, unless indicated otherwise.
- D. Types of Top (and/or panel): Solid Surfacing.
1. Colors, Patterns and Finishes: As indicated, or if not indicated, as selected from any of manufacturer's standard finishes and colors.
  2. Edge Treatment: As indicated on the Drawings.
  3. Thickness - Tops and Substrates:
    - a. Tops (and any flat vertical panels): 3/4-inch, with 1-1/4-inch built-up edges unless indicated otherwise on the Drawings.
    - b. Backsplash: 1/2-inch.
    - c. Edge Treatment: As indicated on the Drawings, or if not indicated, ease all exposed edges to 1/16" radius, and seam width of less than 1/8".
      - 1) DuPont-approved adhesive to create color-matched seam.
    - d. Substrates: Refer to the Drawings for thickness of plywood below solid surface tops, splashes, etc., or if not indicated, at least 3/4-inch thick at horizontal and sloped surfaces (and at least 1/2-inch thick at any vertical panels).
  4. Allowable tolerances:
    - a. Flat and true to within 1/8" of a flat surface over a 10' length.
    - b. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.
    - c. Variation in Component Size: 1/8" over a 10' length.
    - d. Location of Openings: 1/8" from indicated location.
  5. Provide manufacturer's 10-year warranty against defects in materials.
    - a. Warranty shall provide material to repair or replace defective materials.
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- b. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
- c. The above warranty shall be in addition to, shall be in effect simultaneously with, and shall not limit or alter other project or product warranties or guarantees, nor shall it serve as limitation to other remedies available to the Owner.

**206 FINISHING OF INTERIOR ARCHITECTURAL WOODWORK:**

- A. Quality Standard: Comply with AWS Section 5, unless otherwise indicated.
- B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.
- C. Interiors for wood cabinets: To match wood veneer.
- D. Melamine clad interiors for wood cabinets: To match HPDL.

**207 ARCHITECTURAL WOOD VENEER CABINETS:**

- A. Quality Standard:
  - 1. Comply with AWS Section 10.
  - 2. Grade: Premium.
  - 3. Design: Flush Overlay - Type A- Frameless construction.
- B. Wood Veneer Cladding: As follows:
  - 1. Grade; Premium, Grade I.
  - 2. Lumber Species: Select White Birch, unless scheduled otherwise.
  - 3. Cut: Plain sliced.
- C. Hardboard: AHA A135.4 (tempered).
- D. Core Materials:
  - 1. MR Moisture Resistant Medium Density Fiberboard: Average 47-pound density grade, ANSI A208.2.
  - 2. Grade AB Plywood.

**208 ARCHITECTURAL LAMINATE CLAD CABINETS:**

- A. Quality Standard:
  - 1. Comply with AWS Section 10.
  - 2. Grade: Premium.
  - 3. Design: Flush overlay - Type A- Frameless construction.
- B. Laminate Cladding: High pressure decorative laminate complying with NEMA LD 3 and as follows:
  - 1. Colors, Patterns and Finishes: As indicated or, if not otherwise indicated, as selected by Architect from laminate manufacturers' standard products in the following categories: Solid, stippled, textured, wood grain and/or patterned colors; Thru-color type.
  - 2. Provide specific types as scheduled.
    - a. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
    - b. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
    - c. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
    - d. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.

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- e. Flame Retardant Surfaces: HGF, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
  - f. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
  - g. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
- C. Hardboard: AHA A135.4 (tempered).
  - D. Melamine clad interiors in laminate cabinets.
  - E. Core Materials:
    - 1. MR Moisture Resistant Medium Density Fiberboard: Average 47-pound density grade, ANSI A208.2.

**209 INTERIOR FRAMES AND JAMBS**

- A. Quality Standard: Comply with AWS Section 10.
  - 1. Grade: Premium.
- B. Wood Species:
  - 1. For Opaque Finish: Any closed-grain hardwood listed in referenced woodworking standard.
  - 2. For Transparent Finish (stained): Match wood doors.
- C. Fire Rated Frames:
  - 1. 20 min and 45 min rated types. Refer to Door Schedule.
- D. Jamb Type: Flat jamb, unless indicated otherwise.

**210 CLOSET AND UTILITY SHELVING:**

- A. Plastic laminate shelving where indicated.
- B. Quality Standard: Comply with AWS Section 6.
- C. Shelving for Opaque Finish: Comply with the following requirements:
  - 1. Grade: Custom.
  - 2. Shelving Material: Birch faced veneer core plywood.
  - 3. Exposed Edging: Solid hardwood.
  - 4. Thickness: 1-inch at wood shelves, unless indicated otherwise
- D. Shelving for Transparent Finish: Comply with the following requirements:
  - 1. Location: Only in rooms where specifically indicated on Drawings.
  - 2. Grade: Custom.
  - 3. Species: AWS Veneer Grade A, Select Red Oak, or White or Yellow Poplar, Rotary Cut (unless scheduled otherwise).
  - 4. Thickness (plywood): 1-inch (minimum), with solid wood nosing.
  - 5. Lumber for shelving, only where indicated on the Drawings: 5/4-inch with nosings as indicated.

**211 FASTENERS AND ANCHORS:**

- A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
- B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-

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place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

**2.12 CABINET HARDWARE AND ACCESSORY MATERIALS:**

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items which are specified in Section 08 7100 - Finish Hardware.
- B. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.
- C. Hardware Finishes: Comply with BHMA 1301 for finishes indicated by BHMA Code Numbers or if not otherwise indicated, provide finishes complying with requirements indicated.
  - 1. For exposed hardware comply with requirements indicated for finish and base indicated at the end of this Section.
  - 2. For concealed hardware provide manufacturer's standard finishes which comply with product class requirements of ANSI/BHMA A156.9, and which match exposed hardware on same cabinet unit.

**2.13 SHELVING SUPPORTS AND RODS**

- A. Wall Mounted Brackets and Standards:
  - 1. Adjustable, double slotted, extra-heavy duty:
    - a. Equivalent to K&V No. 85/185 Series Extra Duty Standards & Brackets.
      - 1) Standards: 1-1/4" wide x 1/2" deep x length indicated. 16 ga. steel. Finish & Color: TBS.
      - 2) Brackets: Vertically adjustable in 1" increments. 14 ga. & 16 ga. steel. Finish & Color: TBS.
  - 2. Clothes Rods:
    - a. Closet Hanger Rod and Support:
      - 1) Rod: Equivalent to K&V No. 770-1. Extra-Duty. Steel. Chrome double-plated finish. Provide with end caps.
      - 2) Flanges: Equivalent to K&V No. 734 and No. 735, two (2) each per rod. Zinc cast. Finish: Match rod.
      - 3) Supports: Fixed closet rod and shelf brackets. Extra-Duty. Equivalent to K&V No. 1198. 10 ga. steel construction. Finish & Color: TBS.
- B. Pilaster Standards and Supports: Provide adjustable shelf standards and related supports of type indicated, with matching finish on fasteners and accessories.
  - 1. Vertical Slotted Standard:
    - a. Mortise mounted, 5/8-inch wide x 3/16-inch deep x length indicated; high strength steel.
    - b. Equivalent to K&V No. 255, Finish & Color: TBS.
  - 2. Shelf Support:
    - a. Shelf support clip; High strength steel.
    - b. Equivalent to K&V No. 256, Finish & Color: TBS.

**2.14 COUNTERTOP SUPPORT**

- A. Countertop support brackets, undercounter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted. Color shall be as selected by Architect from manufacturer's standard colors.
  - 1. Support brackets shall be equal to Rakks EH Counter Support Bracket unless otherwise noted.
    - a. For concealed support, provide Inside Wall Flush-Mount bracket.

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**2.15 CABINET HARDWARE**

- A. Cabinet Hinges: 170-degrees adjustable "CLIP System" concealed self-closing hinges as manufactured by Julius Blum, Inc., or equivalent by Grass or Stanley.
  - 1. Finish shall match hardware finish specified in Section 08 7100 - Finish Hardware in room(s) where occurs.
- B. Cabinet Hinges: Equivalent to 5-knuckle exposed self-closing hinges as manufactured by Julius Blum, Inc., Grass or Stanley.
  - 1. Finish shall match hardware finish specified in Section 08 7100 - "Finish Hardware" in room(s) where occurs.
- C. Cabinet Door and Drawer Pulls:
  - 1. Wire pulls, equivalent to Stanley No. 4484, (ANSI B12012), 4-inches long, with 1-inch clearance; unless indicated otherwise. Pull design shall comply with the Americans with Disability Act (ADA).
    - a. Finish shall match hardware finish specified in Section 08 7100 - Finish Hardware.
- D. Cabinet Door Catches: Manufacturer's standard 2-screw sill mounted unit made of molded nylon, lipped over sill to form bumper and hold in place, with 2-screw mounted heavy door mounted unit with nylon roller; provide spring-mounted units where required.
  - 1. Acceptable Manufacturers: Any of manufacturers listed for other cabinet hardware.
- E. Cabinet Drawer Slides: Heavy Duty, non-corrosive (galvanized) full extension ball bearing slides rated at 100-pounds, with positive stop, and self-closing and lift-out disconnect features; Model No. 1429, as manufactured by Knappe & Vogt, or equivalent by Blum or Grant.
  - 1. At legal size drawers, use K&V No. 1483 or equivalent, rated at 150-pounds, with same features as noted above.
- F. Cabinet Shelf Standards: Manufacturer's standard steel units with anchors and supports 5/8-inch wide x 3/16-inch high, adjustable on 1/2-inch centers; Series 255, as manufactured by K&V, or equivalent by Grant or Stanley.
  - 1. Wood Cabinets: Model No. 255 BRN with No. 256 BRN supports and matching fasteners.
  - 2. Omit standards where fixed shelves are indicated.
  - 3. All standards to be recess mounted (flush in routed dados), unless specifically indicated otherwise.
- G. Cabinet Locks: Where indicated on the Drawings, provide cabinet manufacturer's standard 5-disc tumbler, cam type, keyed differently at each room, with metal strike screwed to wood surface, and master keyed.
  - 1. Furnish 2-keys for each lock.
  - 2. Furnish 5-master keys
  - 3. Finish to match Section 08 7100 - Finish Hardware finish in room(s) where occurs.
  - 4. Location: Where indicated.

**PART 3 - EXECUTION**

**3.01 PREPARATION:**

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Pre-Installation Meeting: Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor; Architect and other Owner Representatives (if any); Installers of architectural woodwork, wet work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions.

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Proceed with woodwork installation only when everyone concerned agrees that required ambient conditions can be maintained.

- C. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.
  - 1. Coordinate location and placement of concealed treated blocking (by others) prior to finish materials installations.
- D. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

**302 INSTALLATION:**

- A. Quality Standard: Install woodwork to comply with AWS Section 2, 6, 10, 11 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
  - 1. Seal all hardware cuts, routed slots, etc., before installation of hardware.
- D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- E. Standing and Running Trim, and Sills: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with referenced Quality Standards for joinery.
- F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.
  - 1. Install cabinets with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.
- G. Wood Storage Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.
- H. Tops: Anchor securely to base units and other support systems indicated. Caulk space between backsplash and wall with specified sealant.
  - 1. Install countertops with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.
- I. Wood Panels: Anchor panels to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
  - 1. Install flush panels with no more than 1/16-inch in 96-inches vertical cup or bow and 1/8- inch in 96-inches horizontal variation from a true plane.
- J. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

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- K. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
  - L. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
  - M. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on brackets, and supports.
    - 1. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
  - N. Install rod flanges for rods as indicated. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.
  - O. Refer to Section 09 9100 - Painting, for final finishing of installed architectural woodwork which is indicated to be painted on-site.

**303 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION:**

- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
- D. Complete the finishing work specified as work of this section, to whatever extent not completed at shop or prior to installation of woodwork.
- E. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

**END OF SECTION**

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**SECTION 07 1113  
BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Bituminous dampproofing.
- B. Drainage panels.

**102 RELATED REQUIREMENTS**

- A. Section 07 2100 - Thermal Insulation: Rigid insulation board used as protection board.
- B. Section 31 2323 - Fill.
- C. Section 33 4100 - Subdrainage.

**103 REFERENCE STANDARDS**

- A. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2023).
- B. ASTM D449/D449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing; 2003 (Reapproved 2021).
- C. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 2013, with Editorial Revision (2019).
- D. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).
- E. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- D. Installer's qualification statement.

**105 FIELD CONDITIONS**

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Mar-flex Waterproofing & Building Products; \_\_\_\_\_: [www.mar-flex.com/#sle](http://www.mar-flex.com/#sle).
- B. W. R. Meadows, Inc; \_\_\_\_\_: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
- C. Substitutions: See Section 01 6000 - Product Requirements.

**202 BITUMINOUS DAMPPROOFING**

- A. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
  - 1. Composition: ASTM D4479/D4479M Type I, asbestos free.
  - 2. VOC Content: Not more than permitted by local, State, and federal regulations.



3. Applied Thickness: 1/16 inch, minimum, wet film.

**203 BITUMEN MATERIALS**

- A. Cold Asphaltic Type:
  1. Emulsified Asphalt: ASTM D1227/D1227M, with fiber reinforcement other than asbestos, Type II, Class 1 or 2.
  2. Asphalt Primer: ASTM D41/D41M, compatible with substrate.

**204 ACCESSORIES**

- A. Drainage Panel: 3/8-inch thick formed plastic, hollowed sandwich.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

**302 PREPARATION**

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

**303 APPLICATION**

- A. Foundation Walls: Apply two coats of asphalt dampproofing.
- B. Foundation Walls: Patch disturbed areas of existing dampproofing with two additional coats of dampproofing of the same generic type.
- C. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- D. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- E. Apply bitumen by spray application.
- F. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F; do not exceed finish blowing temperature for four hours.
- G. Apply bitumen in two coats, continuous and uniform, at a rate of 25 sq ft/gal per coat.
- H. Apply from 2 inches below finish grade elevation down to top of footings.
- I. Seal items watertight with mastic, that project through dampproofing surface.
- J. Place drainage panel directly over dampproofing, butt joints, and position to ensure downward drainage.
- K. Scribe and cut boards around projections, penetrations, and interruptions.

**END OF SECTION**

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**SECTION 07 1300  
SHEET WATERPROOFING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Self-adhered rubberized asphalt sheet membrane.

**1.02 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Concrete: Concrete substrate (floors and walls).
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal termination bar.
- D. Section 07 9010 - Joint Sealers: Sealant for joints in substrates.
- E. Section 31 2000 - Earth Moving.
- F. Section 33 4600 - Subdrainage.

**1.03 REFERENCE STANDARDS**

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- D. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for membrane.
- C. Samples: Submit representative samples of the following for approval.
  - 1. Sheet Membrane.
  - 2. Protection Board.
  - 3. Prefabricated drainage composite.
- D. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- E. Manufacturer's Installation Instructions: Indicate special procedures and acceptable installation temperatures.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Specimen Warranty.
- H. LEED Submittals:
  - 1. For products specified in this Section, submit documentation of recycled content and location of manufacture.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

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- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
  - C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
  - 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
  - 2. Protect mastic and adhesive from moisture and potential sources of ignition.
  - 3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
  - 4. Protect surface conditioner from freezing.
- B. Sequence deliveries to avoid delays, but minimize on-site storage.

**107 PROJECT/SITE CONDITIONS**

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.
- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

**108 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer's warranty upon completion of the work. , except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

**PART 2 - PRODUCTS**

**201 SHEET WATERPROOFING APPLICATIONS**

- A. Self-Adhered Rubberized Asphalt Sheet Membrane:
  - 1. Location: All below grade basement and foundation walls.
  - 2. Cover with protection board.

**202 MANUFACTURERS/PRODUCT**

- A. W. R. Grace & Co.-Conn. Bituthene System 4000 Membrane (for below grade walls) [Basis of Design]: [www.graceconstruction.com](http://www.graceconstruction.com).
- B. Other Acceptable Manufacturers (Subject to meeting specifications):
  - 1. Carlisle Coatings & Waterproofing, Inc CCW MiraDRI 860/861: [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
  - 2. W. R. Meadows: [www.wrmeadows.com](http://www.wrmeadows.com) MEL-ROL.
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

**203 SHEET WATERPROOFING MATERIALS**

- A. Self-Adhered Rubberized Asphalt Sheet Membrane:
  - 1. Thickness: 63 mil, 0.061 inch, minimum.
  - 2. Sheet Width: 3.28 feet, minimum.

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3. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
  4. Products:
    - a. W. R. Grace: Bituthene 4000: [www.gcpat.com](http://www.gcpat.com)
    - b. Carsile; CCW MiraDRI 860/861: [www.carsileccw.com](http://www.carsileccw.com)
    - c. W. R. Meadows; MEL-ROL: [www.wrmeadows.com](http://www.wrmeadows.com)
  - B. Sheet Waterproofing (for Below Grade Wall): Flexible, pre-formed waterproof composite membrane consisting of 0.056 in. (1.4mm) rubberized asphalt, and 0.004 in. (0.1mm) of cross-laminated, high density polyethylene film (HDPE) with self-adhesive surface, and with removable release sheet.
    1. Use with water-based surface conditioner formulated to prepare substrate for waterproofing membrane.
  - C. Termination Bars: Stainless steel; compatible with membrane and adhesives. (See Section 07 6200.)
  - D. Surface Conditioner: Type compatible with membrane.

#### **204 ACCESSORIES**

- A. Drainage Panel: 0.433 inch thick geocomposite drainage sheet system, comprising a hollow studded polystyrene core, covered on one side with a nonwoven, needle punched polypropylene filter fabric and on the other side with a smooth polymeric film. Drainage panel may serve as protection board if approved by manufacturer. Provide separate protection board if recommended by manufacturer.
- B. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, terminations, cants, tape and accessories: acceptable to manufacturer of sheet membrane waterproofing.

### **PART 3 - EXECUTION**

#### **301 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

#### **302 PREPARATION**

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Cast-In-Place Concrete Substrate:
  1. Do not proceed with installation until concrete has properly cured and dried - minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete.
  2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
  3. Repair bugholes over 0.5 inch in length and 0.25 inch deep and finish flush with surrounding surface.
  4. Remove scaling to sound, unaffected concrete and repair exposed area.
  5. Grind irregular construction joints to suitable flush surface.
- E. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
- F. Treat joints and install flashing as recommended by waterproofing manufacturer.
- G. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

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**303 INSTALLATION - MEMBRANE**

- A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
- B. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
- C. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.
- D. Roll out membrane, and minimize wrinkles and bubbles.
- E. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.
- F. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- G. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.
- H. Ensure plastic release liner is removed from underslab waterproofing before pouring concrete is poured.
- I. Pour concrete over underslab waterproofing within time recommended by manufacturer from date membrane is placed.
- J. Place and compact concrete over underslab waterproofing carefully to avoid damage to the membrane. Avoid use of sharp objects to consolidate concrete.
- K. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
- L. Seal daily terminations with troweled bead of mastic.
- M. Install termination bar at top of waterproofing.
- N. Seal membrane and flashings to adjoining surfaces.
- O. Installation shall be according to manufacturer's details to satisfy warranty requirements.

**304 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD**

- A. Apply protection board and related materials in accordance with manufacturer's recommendations.
- B. Adhere protection board to substrate with compatible adhesive.

**305 CLEANING**

- A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

**306 PROTECTION**

- A. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

**END OF SECTION**

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**SECTION 07 1400  
FLUID-APPLIED AIR BARRIER**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Fluid applied vapor permeable membrane air barrier:
  - 1. For application on exterior side of exterior sheathing where used in vertical and other non-horizontal applications.
  - 2. For application on exterior side of CMU walls.
- B. Sealants for substrates of fluid-applied air barrier.
- C. Cant strips and other Other Accessories.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 04 2000 - Unit Masonry: Masonry joints prepared to receive flashings.
- C. Section 07 1300 - Sheet Waterproofing: Sheet membrane waterproofing for below grade slab and walls.
- D. Section 07 4213 - Metal Wall Panels.
- E. Section 07 4213.23 - Metal Composite Material Wall Panels
- F. Section 07 6200 - Sheet Metal Flashing and Trim: Metal parapet covers, copings, and counterflashings.
- G. Section 07 9010 - Joint Sealers: Sealant for joints other than substrates for air barrier in this Section.
- H. Section 09 2116 - Gypsum Board Assemblies: Exterior sheathing receiving fluid-applied air barrier.

**103 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2018 (Reapproved 2022).
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- D. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for air barrier system(s) specified.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures and acceptable installation temperatures.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

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**105 QUALITY ASSURANCE**

- A. Membrane Manufacturer Qualifications: Company specializing in fluid-applied air barrier membranes with ten years experience.
- B. Installer Qualifications: Company specializing in installation of fluid-applied air barrier with minimum five years documented experience.
- C. Mock-Up: Include Fluid-Applied Air Barrier in Mock-Up as described in Section 01 4000 - Quality Requirements.
- D. Comply with ALL special requirements and inspections of air barrier system manufacturer, as required to obtain the required 5-year labor and materials warranty.
- E. Single-Source Responsibility: Obtain primary air barrier materials of each type required from a single manufacturer.
- F. Sealant for Substrate Surfaces: Sealant shall be manufactured by same manufacturer as fluid-applied air barrier.

**106 FIELD CONDITIONS**

- A. Maintain range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply product to wet substrate or during snow, rain, fog, or mist.

**107 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty for air barrier failing to resist penetration of water , except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Fluid-Applied Waterproofing Vapor Permeable Air Infiltration Barrier System (for CMU, Sheathing, and concrete):
  - 1. GE "Elemax 2600 AWB" 100% Silicone Air and Water-Resistive Barrier system; [Basis of Design]: [www.siliconeforbuilding.com/AWB/](http://www.siliconeforbuilding.com/AWB/).
  - 2. Dow Corning "DefendAir 200" Silicone Liquid Applied Air & Weather Barrier: [www.dowcorning.com](http://www.dowcorning.com).
  - 3. Pecora "XL-Perm Ultra VP" Air, Vapor & Water Barrier System: [www.pecora.com](http://www.pecora.com).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

**202 FLUID APPLIED WATERPROOFING MATERIALS**

- A. Fluid-Applied Air Barrier - General: Cold-applied elastomeric fluid-applied membrane.
  - 1. General: Provide fluid-applied air barrier system that is watertight and complies with performance requirements specified, as demonstrated by testing performed by a nationally recognized independent testing laboratory of manufacturer's standard systems according to test methods indicated.
  - 2. Fluid-applied air barrier system shall be compatible with specified substrate.
- B. Liquid Air Infiltration Barrier, Vapor Permeable, Cold-Applied Elastomeric Membrane:, complying with ASTM C 836, one component. (For CMU, Sheathing, and as indicated).
  - 1. Cured Thickness: Comply with manufacturer's recommendation to meet performance specified.
  - 2. Suitable for installation over concrete, and sheathing substrates.
  - 3. UV Resistant.

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4. Membrane Air Permeance ASTM E2178: Not to exceed 0.004 cfm/sq. ft. of surface area (at specified thickness) at test pressure of 0.3 in. water (75 Pa) on CMU block.
  5. Membrane Vapor Transmission per ASTM E96, Method B: Not less than 10 perms.
  6. Product shall withstand weather exposure up to 6 months.
- C. Flexible Flashings: Type recommended by membrane manufacturer.

**203 ACCESSORIES**

- A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Joint Reinforcing/Transition Strip: 2" wide glass fiber tape, self-adhesive polymeric air/vapor barrier membrane (30 mil minimum), or other material applicable for application, which is approved by air barrier manufacturer.
- C. Surface Conditioner: Compatible with membrane compound; as recommended by membrane manufacturer.
- D. Sealant for Substrate Surfaces: As recommended by membrane manufacturer.
- E. Liquid Membrane for details and terminations: As recommended by membrane manufacturer.
- F. Detail Membrane: Flexible, fully-adhered membrane for detail flashing areas: As recommended by membrane manufacturer.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter, including efflorescence, detrimental to adhesion or application of air barrier system.
- C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of air barrier materials.
- D. Verify that items that penetrate surfaces to receive air barrier are securely installed.

**302 PREPARATION**

- A. Protect adjacent surfaces not designated to receive air barrier.
- B. Do not apply air barrier to surfaces unacceptable to manufacturer.
- C. Caulk sheathing joints prior to application of water/air barrier coating. Caulk with manufacturer-recommended joint sealant reinforced with fiberglass mesh tape encapsulated in sealant. Encapsulate fastener heads with manufacturer-recommended sealant. Fiberglass reinforcement is not required for sheathing fastener heads.
  1. Verify that Fluid-Applied air barrier is compatible with sealant used.
- D. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- E. All surfaces must be sound and free from spalled areas, loose aggregate, loose nails or screws, sharp protrusions or other matter that will hinder the adhesion or regularity of the membrane installation. The surface must also be free from frost, dirt, grease, oil or other contaminants. Clean loose dust and dirt from the surface by brushing or wiping with a clean, dry cloth.



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- F. Concrete and other monolithic cementitious surfaces: Pretreat surface irregularities and large voids with liquid membrane, or repair with lean mortar mix or nonshrinking grout.
  - G. CMU surfaces: Strike joints full and flush to face of concrete block. Ensure surface is smooth and free from projections. Fill voids and holes with lean mortar mix or nonshrinking grout.
  - H. Sheathing panels: Fasten corners and edges with appropriate screws. Drive fasteners flush with panel surface (not countersunk). Tape panel butt joints with 2 in. wide sheathing tape recommended by manufacturer.
  - I. Complete detailing prior to applying air barrier.
  - J. Fill and seal cracks and joints between exterior sheathing panels or adjacent substrates, or in masonry, with trowel application of air barrier product and reinforce with strip of 2" (minimum) wide glass fiber tape. Follow manufacturer's instructions if other joint treatment is recommended. Allow recommended cure time before proceeding.
  - K. Proceed with applying air barrier only after substrate cleaning, sealing, and other preparation and sealing of joints and penetrations have been completed.

**303 INSTALLATION**

- A. Apply air barrier in accordance with manufacturer's instructions to specified minimum thickness.
- B. Apply surface conditioner (if required) at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.
- C. Apply by spray a complete and continuous unbroken film of liquid air and water barrier membrane.
- D. Apply air barrier in accordance with manufacturer's instructions to uniform wet film thickness in order to dry to thickness recommended by manufacturer to achieve performance specified.
  - 1. Apply more than one coat, if recommended by manufacturer.
- E. Roll the air barrier after spray application to fill all pin holes.
- F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

**304 FIELD QUALITY CONTROL**

- A. Owner will provide testing services in accordance with Section 01 4000 - Quality Requirements. Contractor to provide temporary construction and materials for testing.
- B. Provide periodic on-site attendance of waterproofing, airbarrier, roofing and insulation manufacturer's representative during installation of this work.

**305 CLEANING AND PROTECTION**

- A. Do not inhibit damp substrate from drying out. Do not expose the backside of the substrate to moisture or rain.
- B. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- C. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 180 days.
- D. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- E. Remove masking materials after installation.

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**END OF SECTION**

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**SECTION 07 1616  
CRYSTALLINE WATERPROOFING**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Crystalline waterproofing, at elevator pit, and elsewhere as noted.
- B. Preparation of surfaces to be waterproofed, including plugging active water leaks.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Cast-in-Place Concrete: Concrete work to be waterproofed.

**103 REFERENCE STANDARDS**

- A. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.
- B. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Test data showing hydraulic permeability.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation methods.
  - 5. Details for waterproofing at joints, intersections, and other special conditions.
- C. Specimen warranty.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacture of products of the type specified.
- B. Installer Qualifications: Acceptable to manufacturer, with documented experience on at least five projects of similar nature within last five years.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Take necessary precautions to keep cementitious materials dry.

**107 FIELD CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results; do not install products under environmental conditions outside manufacturer's absolute limits.

**108 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide installer's warranty agreeing to correct leaking waterproofing for two years from Date of Substantial Completion, unless leakage is caused by structural failure, movement of the structure, or other causes beyond the installer's control.

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**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Crystalline Waterproofing:
  - 1. Tremco, Inc.; "Permaquik Super 200": [www.tremcosealants.com](http://www.tremcosealants.com).
  - 2. W.R. Meadows, Inc; CEM-KOTE CW PLUS: [www.wrmeadows.com](http://www.wrmeadows.com).
  - 3. Xypex Chemical Corporation; XYPEX Concentrate: [www.xypex.com](http://www.xypex.com).

**202 APPLICATIONS**

- A. Crystalline Waterproofing for Building Surfaces:
  - 1. Negative (interior side) of elevator pits.
  - 2. Surfaces as indicated on drawings.

**203 MATERIALS**

- A. Crystalline Waterproofing: Portland cement, quartz or silica sand, and other active chemicals that when applied to surface of concrete forms insoluble crystals in capillary pores preventing passage of liquids, while having no adverse effect on normal properties of concrete.
  - 1. Hydraulic Permeability of Applied Concrete: No measurable leakage or water flow at pressure ranging from 175 psi to 200 psi when tested in accordance with COE CRD-C 48, using at least 2 inch thick sample, and with applied surface preparation and installation in accordance with NRCA (WM).
  - 2. Toxicity: Non-toxic.
  - 3. Color: Gray.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**302 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions, and use sand blasting, water blasting, or acid etching as recommended.
- C. Plug water leaks.
- D. Patch holes, construction joints, and cracks; remove defective concrete.
- E. Obtain approval of manufacturer's field representative before beginning installation.

**303 INSTALLATION**

- A. Install in strict accordance with manufacturer's instructions, maintain environmental conditions required and recommended by manufacturer, and keep a copy of manufacturer's instructions on site.
- B. Coordinate installation with installation of products that must penetrate waterproofed surfaces.
- C. Prevent excessive drying of surface.
  - 1. Cure waterproofing for at least three days, or length of time required by manufacturer, with water spray and adequate air circulation.
  - 2. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.
- D. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

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**304 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Flood test waterproofing application by filling water holding structures to capacity and allowing to stand for not less than 24 hours.
- C. If any leaks appear, notify Architect and drain.
  - 1. Repair leaks at no additional cost to Owner.
  - 2. Repeat flood test until any leakage is eliminated.

**305 PROTECTION**

- A. Protect from damage by weather; do not cover with impermeable (plastic) sheeting unless air circulation is provided.
- B. Touch-up, repair or replace damaged waterproofing after Date of Substantial Completion.

**END OF SECTION**

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**SECTION 07 1900  
WATER REPELLENTS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Water repellents applied to exterior, masonry and stone surfaces.

**102 REFERENCE STANDARDS**

- A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

**103 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, details of tests performed, limitations, chemical composition, and \_\_\_\_\_.
- C. Manufacturer's Qualification Statement.
- D. Installer's Qualification Statement.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements for additional provisions.

**104 MOCK-UPS**

- A. Prepare representative surface 36 by 36 inches in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

**105 FIELD CONDITIONS**

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

**106 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Acrylic Water Repellents:
  - 1. BASF Construction Chemicals;\_\_\_\_: [www.buildingsystems.basf.com/#sle](http://www.buildingsystems.basf.com/#sle).
  - 2. PPG Paints;\_\_\_\_: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - 3. Sherwin-Williams Company;\_\_\_\_: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.



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**202 MATERIALS**

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
  - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
  - 2. Number of Coats: Two.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

**302 PREPARATION**

- A. Protection of Adjacent Work:
  - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
  - 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.
- D. Remove loose particles and foreign matter.
- E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- F. Scrub and rinse surfaces with water and let dry.

**303 APPLICATION**

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply two coats, minimum.
- C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

**END OF SECTION**

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**SECTION 07 2100  
THERMAL INSULATION**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Board insulation and integral vapor retarder at cavity wall construction and underside of floor slabs, and as indicated.
- B. Batt insulation in walls where indicated.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 04 2000 - Unit Masonry Assemblies: Cavity walls for board insulation.
- C. Section 05 4000 - Cold-Formed Metal Framing: Supporting structure for batt insulation, where indicated.

**103 REFERENCE STANDARDS**

- A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

**105 MOCK-UP**

- A. Include Thermal Insulation in mock-up as described in Section 01 4000 - Quality Requirements.

**106 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

**PART 2 - PRODUCTS**

**201 APPLICATIONS**

- A. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) carbon black board.
- B. Insulation Inside Prefabricated Wall Panels: Extruded polystyrene (XPS) board.
- C. Insulation Over Metal Stud Framed Walls, Continuous and CFS System Integration: Extruded polystyrene (XPS) carbon black board.
- D. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.
- E. Insulation Above Ceilings (where indicated): Batt insulation with foil-scrim-kraft (FSK) faced vapor retarder. Batt insulation with no vapor retarder (i.e. unfaced batts) where used with sheet vapor barrier.

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**202 FOAM BOARD INSULATION MATERIALS**

- A. Extruded Polystyrene Board Insulation at masonry cavity walls: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Board Size: 48 x 96 inch.
  - 4. Board Thickness: 1 inch, unless indicated otherwise.
  - 5. Products:
    - a. Dow Chemical Company: [www.dow.com](http://www.dow.com).
    - b. DiversiFoam Products: [www.diversifoam.com](http://www.diversifoam.com).
    - c. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
    - d. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: [www.kingspan.com](http://www.kingspan.com).
- B. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Complies with ASTM C578, and manufactured using carbon black technology.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Type and Thermal Resistance, R-value: Type IV, 5.6 (0.98), minimum, per 1 inch thickness at 75 degrees F mean temperature.
  - 4. Board Size: 48 inch by 96 inch.
  - 5. Board Thickness: 1-3/4 inch.
  - 6. Board Edges: Shiplap, at long edges.
- C. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Type and Thermal Resistance, R-value: Type IV, 5.6 (0.98), minimum, per 1 inch thickness at 75 degrees F mean temperature.
  - 4. Board Size: 15-3/4 inch by 96 inch.
  - 5. Board Thickness: 1-3/4 inch.
  - 6. Board Edges: Square.

**203 BATT INSULATION MATERIALS**

- A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
- B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
  - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
  - 4. Formaldehyde Content: Zero.
  - 5. Thickness: As required to meet the following requirements:
    - a. Roof: R=30.
    - b. Exterior walls: R=19.
    - c. Interior walls: Thickness of Studs.
  - 6. Facing: Unfaced in interior walls, and where used above ceilings in conjunction with Class A sheet vapor barrier.

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7. Facing: Foil-scrim-kraft (FSK) on one side; under trusses where no sheet vapor barrier is used to support batts.
  8. Products:
    - a. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
    - b. Johns Manville: [www.jm.com](http://www.jm.com).
    - c. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
    - d. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  - C. Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C 665; friction fit; unfaced; flame spread index of 0 (zero) when tested in accordance with ASTM E 84.
    1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E 84.
    2. Formaldehyde Content: Zero.
    3. Thickness: As required to meet the following requirements:
      - a. Roof: R=30.
      - b. Exterior walls: R=19.
      - c. Interior walls: Thickness of Studs.
    4. Facing: Unfaced in interior walls, and where used above ceilings in conjunction with Class A sheet vapor barrier.
    5. Facing: Foil-scrim-kraft (FSK) on one side; under trusses where no sheet vapor barrier is used to support batts.
    6. Products:
      - a. Owens Corning: [www.owenscorning.com](http://www.owenscorning.com).
      - b. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
      - c. Substitutions: See Section 01 6000 - Product Requirements.

#### **204 ACCESSORIES**

- A. Sheet Vapor Barrier: Foil facing comprised of 0.0003"aluminum foil bonded to 30 lb. kraft paper with flame retardant adhesive and reinforced with tri-directional fiberglass scrim, or woven polyethylene film sandwiched between two layers of metalized film. Sheet vapor barrier must meet Class A flame spread classification; with flame spread rating less than 25, and smoke developed rating less than 450, in accordance with ASTM E 84. Product shall be FSK Shield manufactured by Fi-Foil Company, or R+Heatshield by Innovative Energy, or approved equal. For substitutions, see Section 01 6000 - Product Requirements.
- B. Tape: Polyethylene self-adhering type, 1.75 inch wide minimum, unless greater width recommended by manufacturer.
  1. 3M "Construction Seaming Tape 8087": [www.3M.com](http://www.3M.com).
  2. Dow "Weathermate Construction Tape": [www.dowbuildingsolutions.com](http://www.dowbuildingsolutions.com).
  3. Typar "Typar Construction Tape": [www.typar.com](http://www.typar.com).
- C. Tape: Reinforced foil tape: Type recommended by sheet vapor barrier manufacturer.
- D. Adhesive: Type recommended by insulation manufacturer for application.

#### **PART 3 - EXECUTION**

##### **301 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

##### **302 BOARD INSTALLATION AT CAVITY WALLS**

- A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.

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1. Tape seal joints between sheets.
  2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
1. Three continuous beads per board length.
  2. Apply beads of adhesive oriented vertically so as not to disrupt the drainage plane between the water/air barrier coating and cavity insulation.
- C. Install boards to fit snugly between wall ties.
- D. Install boards horizontally on walls.
1. Place boards to maximize adhesive contact.
  2. Install in running bond pattern.
  3. Butt edges and ends tightly to adjacent boards and protrusions.
  4. Tape seal board joints.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- F. Place 6 inches wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

**3.03 BOARD INSTALLATION UNDER CONCRETE SLABS**

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

**3.04 BATT INSTALLATION**

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- D. Retain insulation batts under overhead joists/rafters/trusses with sheet vapor barrier under framing members.
- E. Install sheet vapor barrier under trusses with foil facing down. Overlap layers as recommended by manufacturer. Attach vapor barrier as recommended by manufacturer. Tape joints with reinforced foil tape recommended by manufacturer.
- F. Lay insulation batts over top of sheet vapor barrier.
- G. All wet insulation shall be removed and replaced. Provide letter to Architect for record of each occurrence.
- H. Visible gaps and voids for insulation on sheet vapor barrier shall be filled.

**3.05 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**

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**SECTION 07 4213.01  
METAL WALL PANELS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Manufactured single skin metal panels for exterior wall panels, with related flashings and accessory components.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01 4100 - Quality Requirements: Mock-up requirements.
- C. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.
- D. Section 07 1400 - Fluid Applied Air Barrier: Water-resistive barrier under wall panels.
- E. Section 07 2100 - Thermal Insulation.
- F. Section 07 4210 - Composite Framing Support (CI) System: Secondary girt support system
- G. Section 07 4213.02 - Metal Composite Material (MCM) Wall Panels: Adjacent wall panel assembly.
- H. Section 07 4646 - Fiber Cement Siding: Adjacent wall cladding assembly.
- I. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.
- J. Section 09 2116 - Gypsum Board Assemblies: Wall panel substrate.

**103 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- E. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2022.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
  - 1. Physical characteristics of components shown on shop drawings.

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2. Storage and handling requirements and recommendations.
  3. Installation instructions and recommendations.
- C. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.
  - D. Samples: Submit two samples of wall panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.
  - E. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.
- C. Dimensional Coordination with Aluminum Curtainwall, Storefront, and other Products that interface with Metal Panels: The General Contractor is responsible for coordination of the metal panel dimensions (including depth) to ensure proper alignment of finish face of panels with adjacent products. Should the metal panel manufacturer require panel depths different than those present in the Contract Documents, the Shop Drawings submitted shall include a comprehensive solution that includes details and requirements for revisions to all assemblies and building elements impacted by the proposed panel construction.

**106 MOCK-UP**

- A. Integrate materials of this Section into the Exterior Assembly Mock-up per the drawing requirements, including panel system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, and related insulation.
- B. Locate where directed by Architect.
- C. Mock-up may not remain as part of the Work.

**107 DELIVERY, STORAGE, AND HANDLING**

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

**108 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.
- C. Installation Warranty for Building Rainscreen Assembly: Installer of exterior rainscreen assembly (including air/vapor barrier and attachments, framing, and exterior panels) to provide 10-year warranty that includes coverage for defective materials and/or workmanship. This warranty will also clearly include materials, labor, necessary activity to access these areas, and removal of any materials to effect repairs and restore to watertight conditions.
- D. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that show evidence of deterioration of factory-applied finish within specified warranty period.
  1. Exposed Panels Finish – deterioration includes the following:

- a. Color fading more than 5 hunter units when tested according to ASTM D 2244.
- b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
- c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.
2. Warranty Period:
  - a. 20 Years from the date of Substantial Completion.

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## **PART 2 PRODUCTS**

### **201 MANUFACTURERS**

- A. Exterior Metal Wall Panels and Accessories.
  1. Basis of Design Manufacturer: Peterson Aluminum Corporation: [www.pac-clad.com](http://www.pac-clad.com).
  2. Other Acceptable Manufacturers:
    - a. Centria Corporation: [www.centria.com](http://www.centria.com).
    - b. Englert, Inc.: [www.englertinc.com](http://www.englertinc.com).
    - c. Fabral: [www.fabral.com](http://www.fabral.com).
  3. Substitutions: See Section 01 6000 - Product Requirements.

### **202 MANUFACTURED METAL PANELS**

- A. Exterior Metal Wall Panel System:
  1. Product: Concealed Fasteners: Precision Series HWP Wall Panels manufactured by Peterson Aluminum Corporation
  2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
  3. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
  4. Panel Width: 16 inches.
  5. Color: As selected by Architect from manufacturer's full line.
  6. Texture: Smooth
  7. Provide exterior wall panels.
  8. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall. Provide system tested in accordance with ASTM E330/E330M and certified to be without permanent deformation or failure in accordance with design wind velocities for project geographic location and probability of occurrence based on data from wind velocity maps provided in ASCE 7 and as approved by authorities having jurisdiction (AHJ).
  9. Maximum Allowable Deflection of Panel:  $L/180$  for length(L) of span.
  10. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
  11. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
  12. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
  13. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
- B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- C. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.
- D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.



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**203 MATERIALS**

- A. Exterior Metal Wall Panels:
  - 1. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
- B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

**204 FINISHES**

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

**205 ACCESSORIES**

- A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
- B. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- C. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized.
  - 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping non-corrosive screws.
- D. Field Touch-up Paint: As recommended by panel manufacturer.
- E. Bituminous Paint: Asphalt base.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that building framing members are ready to receive panels.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

**302 PREPARATION**

- A. Subgirt installation to be coordinated with 07 4210 Composite Framing Support (CFS) CI System and installed perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

**303 INSTALLATION**

- A. Install panels on walls in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Locate joints over supports.
- E. Lap panel ends minimum 2 inches.
- F. Provide expansion joints where indicated.
- G. Use concealed fasteners unless otherwise approved by Architect.
- H. Damaged wall panels should not be installed.
- I. Wall panels shall be protected after installation.
- J. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

**304 TOLERANCES**

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

**305 CLEANING**

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.
- C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

**END OF SECTION**

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**SECTION 07 4213.23  
METAL COMPOSITE MATERIAL WALL PANELS**

**PART 1 - GENERAL**

**5.01 SECTION INCLUDES**

- A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.
- B. Matching flashing and trim.

**5.02 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Cast-In-Place Concrete: Installation of anchors.
- C. Section 04 2000 - Unit Masonry: Installation of anchors.
- D. Section 05 4000 - Cold-Formed Metal Framing: Panel support framing.
- E. Section 06 1000 - Rough Carpentry: Plywood substrate.
- F. Section 07 4210 - Composite Framing Support (CFS) CI System: Secondary girt support system.
- G. Section 07 4213 - Metal Wall Panels: Adjacent wall cladding.
- H. Section 07 4646 - Fiber Cement Siding: Adjacent wall cladding.
- I. Section 07 5416 - Ethylene Interpolymer (KEE) Roofing: Roofing system.
- J. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.
- K. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.
- L. Section 07 9005 - Joint Sealers.

**5.03 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.
- F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- H. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- I. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).
- J. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).

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- K. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2023.
  - L. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007 (Reapproved 2015).
  - M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
  - N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

**504 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
  - 1. Require attendance by the installer and relevant sub-contractors.
  - 2. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
  - 3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
  - 4. Review procedures for protection of work and other construction.
  - 5. Review safety precautions.

**505 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
  - 1. Finish manufacturer's data sheet showing physical and performance characteristics.
  - 2. Storage and handling requirements and recommendations.
  - 3. Fabrication instructions and recommendations.
  - 4. Specimen warranty for finish, as specified herein.
- C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
  - 1. Physical characteristics of components shown on shop drawings.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation instructions and recommendations.
  - 4. Specimen warranty for wall system, as specified herein.
- D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
  - 1. Indicate panel numbering system.
  - 2. Differentiate between shop and field fabrication.
  - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
    - a. Coordinate panel support framing requirements with cold formed metal framing engineer.
  - 4. Include large-scale details of anchorages and connecting elements.
  - 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
  - 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

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- E. Selection Samples: For each finish product specified, submit at least three sample color chips representing manufacturer's standard range of available colors and patterns.
  - F. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch square, and representing actual product in color and texture.
  - G. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
  - H. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.
  - I. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
  - J. Installer's qualification statement.
  - K. Testing agency's qualification statement.
  - L. Maintenance Data: Care of finishes and warranty requirements.
  - M. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**506 QUALITY ASSURANCE**

- A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.
- B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing wall panel systems specified in this section.
  - 1. With not less than three years of documented experience.
  - 2. Approved by MCM sheet manufacturer.
  - 3. Submit contact names and phone numbers for at least three references connected with successful past projects.
- D. Installer Qualifications: Company specializing in performing work of type specified in this section.
  - 1. With minimum three years of documented experience.
  - 2. Approved by wall panel system manufacturer.
  - 3. Submit contact names and phone numbers for at least three references connected with successful past projects.
- E. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.
- F. Mock-Up: Include Metal Composite Material Wall Panels in mock-up as described in Section 01 4000 - Quality Requirements.

**507 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
  - 1. Protect finishes by applying heavy-duty removable plastic film during production.
  - 2. Package for protection against transportation damage.

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3. Provide markings to identify components consistently with drawings.
  4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.
- B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
1. Store in well-ventilated space out of direct sunlight.
  2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
  3. Store at a slope to ensure positive drainage of accumulated water.
  4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
  5. Avoid contact with other materials that might cause staining, denting, or other surface damage.
  6. Do not store on porous damp surface, such as foam or wood pallets. Permanent staining could result.
- C. Handle products in such a way as to avoid fingerprinting or contact with arms, etc.
1. Use gloves and long sleeves.

**508 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Delamination Warranty: Provide manufacturer's written warranty against bond failure and delamination of panel for minimum of 5 years.
- C. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a two year period after Date of Substantial Completion.
- D. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
  2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
  3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

**PART 2 - PRODUCTS**

**601 MANUFACTURERS/PRODUCTS**

- A. Metal Composite Material (MCM) Sheet Manufacturers:
1. ALUCOBOND by 3A Composites USA; ALUCOBOND PLUS: [www.alucobondusa.com/#sle](http://www.alucobondusa.com/#sle).
  2. Alfrex, LLC; Alfrex fr: [www.alfrexusa.com/#sle](http://www.alfrexusa.com/#sle).
  3. Alcoa Reynobond ACM: [www.arconic.com](http://www.arconic.com).
  4. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core): [www.alpolic-america.com/#sle](http://www.alpolic-america.com/#sle).
  5. Centria: [www.centria.com](http://www.centria.com).

**602 WALL PANEL SYSTEM**

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.
1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
  2. Provide panel jointing and weatherseal using a "wet", sealant-sealed system.
  3. Anchor panels to supporting framing without exposed fasteners.

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**B. PERFORMANCE REQUIREMENTS**

1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
2. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
  - a. Design Wind Pressure: In accordance with IBC - 2021 edition.
  - b. Design Wind Pressure: In accordance with applicable building code.
  - c. Inward Design Wind Pressure: \_\_\_\_\_psf.
  - d. Outward Design Wind Pressure: \_\_\_\_\_psf.
  - e. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
  - f. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
3. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.27 psf minimum, after 15 minutes.
  - a. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
  - b. Design to drain leakage and condensation to the exterior face of the wall.

**C. PANELS**

- D. Panels:** 1 inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
1. Reinforce corners with riveted aluminum angles.
  2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
  3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
  4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
  5. Metallic Finished Panels: Maintain consistent grain of MCM sheet; specifically, do not rotate sheet purely to avoid waste.
  6. Fabricate panels under controlled shop conditions.
  7. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
  8. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
    - a. Make panel lines, breaks, curves, and angles sharp and true.
    - b. Keep plane surfaces free from warp or buckle.
    - c. Keep panel surfaces free of scratches or marks caused during fabrication.
  9. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.
  10. Weep hole locations to be review and approved by the Architect prior to installation.



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**603 MATERIALS**

- A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials; core material free of voids and spaces; no foamed insulation material content. This product hereinafter and on plans may be referred to as ACM (Aluminum Composite Material).
  - 1. Overall Sheet Thickness: 4 mm.
  - 2. Face Sheet Thickness: 0.020 inches, minimum.
  - 3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
  - 4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
- B. Metal Framing Members: See Section 07 4210 - Composite Framing Support (CFS) CI System for framing member requirements.
  - 1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.

**604 FINISHES**

- A. **Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, with at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.**

**605 ACCESSORIES**

- A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; see Section 07 6200 for additional requirements.
- B. Support for Cladding and Continuous Insulation: See Section 07 4210 - Composite Framing Support (CFS) CI System for framing member requirements.
- C. Anchors, Clips, and Accessories: Use one of the following:
  - 1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
  - 2. Steel complying with ASTM A36/A36M and hot-dip zinc coating to ASTM A153/A153M.
  - 3. Steel complying with ASTM A36/A36M and hot-dip galvanized to ASTM A123/A123M, with Coating Thickness Grade of 100.
- D. Fasteners:
  - 1. All exposed fasteners, screws, bolts, and blind fasteners to be non-corrosive materials unless approved otherwise by the Architect.
  - 2. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
  - 3. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
  - 4. Bolts: Stainless steel.
  - 5. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.
- E. Joint Sealer: Provide color to match wall panels silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.

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1. See Section 07 9200 for additional requirements.
  - F. Provide panel system manufacturer's and installer's non-corrosive accessories, including fasteners, clips, anchorage devices, and attachments.

**606 FABRICATION**

- A. Use Industry Standard Fabrication techniques.
- B. Fabricate panels such that panels serving as soffit can be successfully sealed and counterflashed as required for weathertight installation.

**PART 3 - EXECUTION**

**701 EXAMINATION**

- A. Examine dimensions, tolerances, and interfaces with other work.
  1. Verify that weather barrier system is properly installed; see Section 07 2500 for requirements.
- B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

**702 PREPARATION**

- A. Protect adjacent work areas and finish surfaces from damage during installation.
- B. Provide anchorage items to be cast into concrete or built into masonry to appropriate installer(s) together with setting templates.
  1. See Section 03 3000 for additional cast-in-place concrete requirements.
  2. Section 03 4100 for additional precast concrete requirements.
  3. See Section 04 2000 for additional unit masonry requirements.

**703 INSTALLATION**

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
- F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
- G. Where joints are designed for field-applied sealant, seal joints completely with specified sealant.
- H. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

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- I. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
    - 1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
    - 2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
    - 3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
    - 4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
  - J. Replace damaged products.

**7.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.
- C. Site Visits: Schedule two site visits during execution of installation.

**7.05 CLEANING**

- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants. Weep hole locations to be review and approved by the Architect prior to installation.
- B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Clean installed products in accordance with manufacturer's instructions.

**7.06 PROTECTION**

- A. Protect installed panel system from damage until Date of Substantial Completion.

**END OF SECTION**

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**SECTION 07 5400  
THERMOPLASTIC MEMBRANE ROOFING (TPO)**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Cover Board.
- D. Flashings.
- E. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this project.
- B. Section 06 1000 - Rough Carpentry: Wood cant strips, nailers and curbs.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing and counterflashing installation and requirements, including termination bar.
- D. Section 07 7123 - Manufactured Gutters and Downspouts.

**103 REFERENCE STANDARDS**

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.
- D. FM (AG) - FM Approval Guide; Current Edition.
- E. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2022).

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- C. Specimen Warranty:
  - 1. Provide an unexecuted copy of the warranty specified for this Project. Identify the terms and conditions required of the manufacturer along with any and all additionally required riders. Identify the terms and conditions required of the Owner to maintain the warranty.
    - a. Submit a letter from the Roofing Contractor to be included in the warranty. This letter shall be signed and dated to indicate the Roofing Contractor has reviewed the roofing system and therefore warrants the system as designed and intended to be warrantied.

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- b. Submit a letter from the roofing manufacturer to be included in the warranty. This letter shall be signed and dated by a manufacturer's representative to indicate the manufacturer has reviewed the roofing submittal from the Roofing Contractor and confirms compliance with specifications based on materials supplied in the submittal.
  - D. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation. Show penetration details, and indicate field-wrapped flashings. Provide insulation fastening/adhesion patterns for any and all pieces of insulation required for roof system.
  - E. Provide plans showing areas of tapered insulation.
  - F. Samples for Verification: Submit two samples 12x12 inches in size illustrating insulation and roof membrane.
  - G. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
  - H. Installer's qualification statement.
  - I. Copies of all roofing submittals and roof warranty information shall be submitted for review and returned Approved prior to pre-roofing conference. These submittals shall be job specific containing project name, location, etc.
  - J. Roofing and insulation manufacturers shall submit a letter stating they will provide site inspections that confirm the project is being constructed as specified, by an experienced, full-time employee of the respective manufacturer. This letter shall be submitted with sample warranty submittal.
  - K. Warranty Documentation:
    - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
    - 2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.
    - 3. Include wind-uplift resistance language.
  - L. Provide Manufacturer's documentation certifying that the roof design provided complies with the performance requirements for that particular system, as set forth in IBC Chapter 15 in Section 1504. The documentation shall be attached to the roof warranty provided at the close-out of the project.
  - M. General Contractor's Roofing Guarantee.

**106 QUALITY ASSURANCE**

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of this section with at least three years of documented experience.
  - 1. With minimum five years documented experience.
- D. Insurance and Code Requirements: Provide materials complying with governing regulations that can be installed to comply with the following, and provide installation to comply:
  - 1. UL Fire Classified.
  - 2. Wind Uplift Resistance: As per local building code and warranty requirements.
  - 3. FM 1-120 wind uplift rating.

**E. PRE-ROOFING CONFERENCE:**

1. A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, Building Commission Inspector, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable) and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.
2. The pre-roofing conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.
3. The following are to be accomplished during the conference:
  - a. Review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
  - b. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
  - c. Establish roofing schedule and work methods that will prevent roof damage.
  - d. Require that all roof penetrations and walls be in place prior to installing the roof.
  - e. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
  - f. Establish weather and working temperature conditions to which all parties must agree.
  - g. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.
4. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor, the Building Commission, the Building Commission Inspector, and the Owner.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

**1.08 FIELD CONDITIONS**

- A. The Roofing Contractor shall accept the substrate prior to installation of roofing system.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is below 40 degrees F.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

**109 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Special Project Guarantee: Submit three executed copies of Roofing Guarantee on the form at the "General Conditions" Section of the Project Manual, covering the work of this Section, including roofing membrane, composition flashing, roof insulation, any vapor retarders, and roofing accessories, signed by the Contractor.
- C. Provide all necessary roof, and related, components to achieve specified warranty.
- D. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes. Warranty shall be manufacturer's standard "No Dollar Limit" ("NDL") labor and material warranty agreement including flashing endorsement, and non-depreciating full replacement warranty, signed by an authorized representative of the manufacturer. Provide form that was published and submitted with product literature as of date of Contract Documents for the following and period of time:
  - 1. Include language relating to wind-uplift resistance as indicated in 07 5400-2.07 Wind Uplift Resistance.
  - 2. For repair and replacement include costs of both material and labor in warranty. Warranty shall cover in part, wind load, leakage or failure caused by improper workmanship or materials, to include insulation, insulation adhesives, fasteners, membrane adhesives, field membranes, and sheet metal work.
  - 3. Warranty Period: Manufacturer's standard 20-year "NDL" warranty.
  - 4. Hail Resistance Rating: MH-Moderate Hail.
- E. The Guarantee and Warranty shall be governed by the laws of the State of Alabama and be in addition to and run concurrently with other warranties made by the Contractor under the requirements of the Contract Documents, and shall not limit or deprive the Owner of any other rights the Owner may have for remedy.
  - 1. Unless manufacturer's warranty agrees to arbitration through the American Arbitration Association or directly references State of Alabama for enforcement, manufacturer shall provide warranty rider stating that manufacturer's warranty is governed by and shall be enforced in accordance with laws of Alabama, and that in the event of a conflict between the provisions of the Warranty and the provisions of the rider, the provisions of the rider shall control.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Thermoplastic Polyolefin (TPO) Membrane Materials:
  - 1. Carlisle Roofing Systems, Inc; Sure-Weld TPO: [www.carlisle-syntec.com/#sle](http://www.carlisle-syntec.com/#sle).
  - 2. GAF EverGuard TPO Membrane System: [www.gaf.com](http://www.gaf.com).
  - 3. Johns Manville: [www.specjm.com](http://www.specjm.com).
  - 4. Versico LLC; "Versiweld": [www.versico.com](http://www.versico.com).

**202 ROOFING - UNBALLASTED APPLICATIONS**

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

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**203 MEMBRANE ROOFING AND ASSOCIATED MATERIALS**

- A. Membrane Roofing Materials:
  - 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
    - a. Thickness: 80 mil, 0.080 inch, minimum.
  - 2. Smooth.
  - 3. Sheet Width:
  - 4. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Fasteners: As recommended and approved by membrane manufacturer.
- D. Flexible Flashing Material: Same material as membrane.
- E. Material Standards: Thermoplastic single-ply roof coverings shall comply with ASTM D 4434, ASTM D 6754, or ASTM D 6878. (per IBC2006 1507.13.2)

**204 COVERBOARD**

- A. Deck Sheathing: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
  - 1. Products:
    - a. Georgia-Pacific DensDeck Prime: [www.densdeck.com](http://www.densdeck.com).
    - b. Substitutions: See Section 01 6000 - Product Requirements.

**205 INSULATION**

- A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 2 and with the following characteristics:
  - 1. Compressive Strength: 20 psi minimum.
  - 2. Tapered Board: Slope to drain; minimum thickness 1/2 inch; fabricate of fewest layers possible.
  - 3. Manufacturers:
    - a. Dow Chemical Co: [www.dow.com/sle](http://www.dow.com/sle).
    - b. Versico, a division of Carlisle Construction Materials, Inc: [www.versico.com](http://www.versico.com).

**206 IMPACT PERFORMANCE/ DESIGN CRITERIA**

- A. Impact Resistance: Roof Covering in this Section shall resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470. (per IBC2006 1504.7)

**207 WIND UPLIFT RESISTANCE**

- A. Roof System shall comply with FM 1-120 requirements for wind uplift resistance.

**208 ACCESSORIES**

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane. Provide with clamp rings.
- B. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.
- C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
  - 1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.
  - 2. Corrosion-resistant, as recommended by membrane manufacturer.



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- D. Bonding Adhesive: Manufacturer's standard, water based.
  - E. Coated Metal: Provide TPO Coated Metal: 24 gauge galvanized steel sheet coated with a layer of TPO. The sheet shall be cut to the appropriate width and shall be used to be fabricated to the roof perimeter profiles indicated. The TPO roof membrane shall be able to be heat welded directly to the coated metal.
    - 1. Product: Coated Metal produced by same manufacturer as supplier of membrane roofing.
    - 2. Color: Same as roofing membrane.
  - F. Pipe Supports: Polycarbonate resin roller and rod situated in polycarbonate resin seat, designed to support roof-mounted mechanical piping, allowing for thermal expansion and contraction of pipes. Provide with non-corrosive pipe strap.
    - 1. Miro Industries, Inc.; Model 3-R-2 [Basis of Design]: [www.miroind.com](http://www.miroind.com).
    - 2. For Substitutions: See Section 01 6000 - Product Requirements.
  - G. Walkway Pads: Primary roofing system manufacturer's standard walk pads, of same material or fully compatible material and same (or similar) color as roofing membrane, with textured surface on exposed side, for heat-welding to roofing membrane. Approximately 30-inches wide with a 2-inch spacing between pads unless otherwise required. Minimum thickness: same thickness as roofing membrane.

### **PART 3 - EXECUTION**

#### **301 EXAMINATION**

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

#### **302 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE**

- A. Attachment of Insulation:
  - 1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM DS 1-28 Factory Mutual requirements.
  - 2. Where exposed ceilings occur, Contractor will be responsible for trimming all screw shanks and painting screw shank ends.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer. For multiple layers, stagger joints in both directions between courses with no gaps, to form a complete thermal envelope.
- C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- D. Provide additional insulation, if required, to prevent ponding and to ensure positive drainage on roof deck.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- G. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

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**303 COVER BOARD**

- A. Attach cover board securely to substrate, in accordance with manufacturer's recommendations.

**304 INSTALLATION - MEMBRANE**

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Overlap edges and ends and seal seams by heat welding, minimum 3 inches. Seal permanently waterproof. Comply with manufacturer's written instructions. Apply uniform bead of sealant to joint edge.
1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sealant.
  2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
  3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- D. At intersections with vertical surfaces:
1. Extend membrane up a minimum of 4 inches onto vertical surfaces.
  2. Fully adhere flexible flashing over membrane and up to termination bar.
- E. Around roof penetrations, seal flanges and flashings with flexible flashing.
1. Provide fabricated TPO boots at pipe penetrations.
  2. Field-wrap flashings at penetrations.
- F. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.
- G. Install walkway pads in all areas indicated, and/or where required to walk to and work on service sides of all roof-mounted equipment.
- H. Install second layer of membrane around all exhaust fans from kitchens and similar grease-producing areas, to a distance of six feet from the fan on all sides, or as recommended by membrane manufacturer.
- I. Install pipe supports at spacing recommended by manufacturer, adhering to roofing membrane in accordance with manufacturer's recommendations. Each pipe support shall be properly elevated to distribute load weight evenly.

**305 COATED METAL INSTALLATION**

- A. Install coated metal in accordance with manufacturer's requirements for project conditions.

**306 FIELD QUALITY CONTROL**

- A. Owner will provide testing services in accordance with Section 01 4000 - Quality Requirements. Contractor to provide temporary construction and materials for testing.
- B. Provide \_\_\_\_\_ on-site attendance of roofing and insulation manufacturer's representative, as required for warranty purposes, of this work.
1. Roofing manufacturer shall provide reports for each day on site viewing roof installation. All reports shall be delivered to Contractor and Architect within 72 hours of observation. The Contractor shall include these reports as part of the final warranty package.
  2. Insulation manufacturer shall provide reports for each day on site reviewing insulation installation. All reports shall be delivered to Contractor and Architect within 72 hours of observation. The Contractor shall include these reports as part of the final warranty package.
- C. Ensure slope of roof is such that by 48 hours after a rainfall, there is no ponding water on roof.

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**3.07 CLEANING**

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

**3.08 PROTECTION**

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

**END OF SECTION**

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**SECTION 07 6200  
SHEET METAL FLASHING AND TRIM**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings and counterflashings.
- B. Self-Adhered Membrane Flashing.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 04 2000 - Unit Masonry Assemblies: Through-wall flashings in masonry.
- C. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.
- D. Section 07 1300 - Sheet Waterproofing: Termination bar specified herein used.
- E. Division 7 Membrane Roofing Sections: Termination bar specified herein used at membrane roofing turning up vertical surfaces.
- F. Section 07 5416 Ethylene Interpolymer [KEE] Roofing
- G. Section 07 7100 - Roof Specialties: Manufactured copings and manufactured expansion joint covers, and roof edge flashings.
- H. Section 07 7200 - Roof Accessories
- I. Section 07910 - Joint Sealers.
- J. Section 09 9100 - Painting: Field painting.

**103 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. CDA A4050 - Copper in Architecture - Handbook; current edition.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 8 by 10 inch in size illustrating metal finish color.

**105 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

- 
- C. Single-Source Responsibility: Self-adhering flashings at rough openings shall be manufactured by manufacturer of water/air barrier coating specified in Section 07 1400 - Fluid-Applied Air Barrier, for material compatibility and single-source manufacturing responsibility.
  - D. Coordination with Metal Roof Panels: Coordinate product selection of self-adhered membrane flashing used for underlayment at metal roof, with metal roofing supplier to assure compatibility.
  - E. Mock-Up: Include Sheet Metal Flashing and Trim in mock-up as described in Section 01 4000 - Quality Requirements.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Sheet Metal Flashing and Trim Manufacturers:
  - 1. Fairview Architectural LLC; VitraEdge\_\_\_\_\_ : [www.fairview-na.com/#sle](http://www.fairview-na.com/#sle).
  - 2. Petersen Aluminum Corporation;\_\_\_\_\_ : [www.pac-clad.com/#sle](http://www.pac-clad.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

**202 SHEET MATERIALS**

- A. Aluminum-zinc alloy coated steel sheet ("Galvalume") conforming to ASTM A792/ A 792M; minimum AZ50 coating, with minimum 50,000 p.s.i. yield.
  - 1. Finish: 3-coat full strength (70-percent) Kynar 500 resin (20 year) finish.
    - a. Color: As selected by Architect from Manufacturer's full range of preimum colors.
  - 2. Thickness: minimum 24-gauge.
- B. Self-Adhering Flashing - Around Windows, Doors, and Critical Wall Penetrations: Self-adhesive, rubberized asphalt bonded to polyethylene film, cold applied tape, with silicone-coated release sheet; 40 mil thickness; 12" wide roll, or as required. Provide primer when recommended by flashing manufacturer.
  - 1. Carlisle Coatings & Waterproofing, Inc.; CCW-705-TWF, : [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
  - 2. Grace, W. R. & Co.; Perm-A-Barrier Wall Flashing: [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
  - 3. Tremco, ExoAir 110: [www.tremcosealants.com](http://www.tremcosealants.com).
  - 4. Substitutions: Section 01 6000 - Product Requirements.

**203 ACCESSORIES**

- A. Sealant: Type specified in Section 07 9010.
- B. Termination Bar: Stainless steel bar designed to terminate and seal top or edge of flashing on vertical surfaces. Bar shall be flat and shall have pre-drilled holes 8" o.c. for attachment to substrate with appropriate non-corrosive fasteners. Bar shall be 3/4" wide by 1/8" thick.
  - 1. Termination bar shall be encapsulated with compatible sealant. Note: The sealant shall be compatible with the water/air barrier coating, and shall be compatible with the waterproofing membrane and adhesives. (Acrylic latex sealant shall NOT be used.)

**204 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

**205 SELF-ADHERED MEMBRANE FLASHING**

- A. Self-Adhered Membrane Flashing: Used as underlayment under Shingle Roofs and Metal Siding (Occuring Over Solid Substrates): Self-Adhering, Rubberized Asphalt bonded to Polyethylene-Film, 40 mils (1.0 mm) thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer. Thermal stability: Unaffected at -20 deg. F.; ASTM D 1970.
  - 1. Carlisle Coatings & Waterproofing, Inc.; Dri-Start "A": [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
  - 2. Grace, W. R. & Co.; Ice and Water Shield [Basis of Design]: [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
  - 3. Johns Manville International, Inc.; Roof Defender: [www.jm.com](http://www.jm.com).
  - 4. Owens Corning; WeatherLock Flex: [www.owenscorning.com](http://www.owenscorning.com).
- B. Self-Adhered Membrane Flashing - High Temperature: Used as underlayment under Metal Roof or horizontal applications of metal (Occuring Over Solid Substrates): Provide primer recommended by underlayment manufacturer.
  - 1. Material: Slip-resisting top surface laminated to layer of rubberized asphalt adhesive, with disposable release sheet. Self-adhering, cold-applied.
  - 2. Thermal stability: Stable after testing at 240 deg. F. (ASTM D1204); and flexibility unaffected at -20 deg. F. (ASTM D1970).
  - 3. Weight: 0.22 pounds/sq. ft., installed.
  - 4. Permeance: 0.05 perms maximum (ASTM E96).
  - 5. Exposure: Can be left exposed maximum of 120 days from date of installation per ASTM G90 - EMMAqua test.
  - 6. Thickness: 40 mils thick, minimum.
  - 7. Manufacturers/Product:
    - a. Carlisle Coatings & Waterproofing, Inc., : [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
    - b. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
    - c. Grace, W.R. & Co.; "Ice and Water Shield HT" [Basis of Design]: [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
    - d. Henry Company: [www.henry.com](http://www.henry.com).
- C. Install 1-layer over substrate surface at the following locations:
  - 1. 36-inches wide in all valleys, over all hips and ridges (18-inches on each side of each valley, hip ridge, and top ridge), and at perimeter edges of shingle roof planes.
  - 2. Below all metal roofing, and behind any non-insulated metal wall panels and metal siding.
  - 3. Where roofing planes intersect vertical walls and planes, turn edges up at least 8-inches.
  - 4. Cover sheathing at corners.
  - 5. Wrap head, jambs, and sill of all punched openings.
- D. Coordinate with, and refer to Division 7 Roofing and Siding Sections for additional information and requirements.

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**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

**302 PREPARATION**

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

**303 INSTALLATION**

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.
- E. Install continuous through-wall flashing and sub-sill flashing with interior end dam prior to setting doors and windows. Typical at head and sill conditions. Jamb flashing to terminate in sub-sill flashing. Install metal head flashing at all window and door heads per manufacturer's standard detail.
- F. Where sloping roof abutts a wall, integrate metal step flashing into the shingle roofing in accordance with best industry standards to provide weathertight joint.
- G. Apply Self-Adhered Membrane Flashing used as underlayment in accordance with manufacturer's recommendations.
  - 1. Lap in shingled manner.
  - 2. Flash perimeter of wall openings.
  - 3. Cover internal and external corners with additional layer of self-adhered membrane flashing.
- H. Apply self-adhered flashing in accordance with manufacturer's recommendations.

**END OF SECTION**

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**SECTION 07 7100  
ROOF SPECIALTIES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Manufactured roof specialties, including roof edge flashings, copings, fascias, and scuppers.
- B. Roof guardrail system.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 06 1000 - Rough Carpentry.
- C. Section 07 5416 - Ethylene Interpolymer [KEE] Roofing.
- D. Section 07 7123 - Manufactured Gutters and Downspouts.
- E. Section 07 7200 - Roof Accessories: Manufactured roof hatches.
- F. Section 07 9010 - Joint Sealers.

**103 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- C. NRCA (RM) - The NRCA Roofing Manual; 2024.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, installation instructions, available profiles, textures, colors, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two samples of coping, and fascia, 12 inch long, x actual width, illustrating component shape, finish, for color selection.
- E. Samples: Submit two appropriately sized samples of fascia, and coping and roof edge flashings, for color verification.
- F. Roof Guardrail Color Samples: Submit colors available for Roof Guardrail System, for selection. Submit verification samples of selected color, for approval.
- G. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

**105 QUALITY ASSURANCE**

- A. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of experience.
  - 1. Engage an experienced installer who has completed coping installations similar in materials, design, and extent to that indicated for project, that has resulted in construction with a record of successful service and performance.



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- B. Source limitations for system of accessories: Obtain each color, texture, pattern, and type of coping, and related accessories from one source, with resources to provide products of consistent quality in appearance and physical properties without delaying the work.
  - C. Mock-Up:
    - 1. Include Roof Specialties in Mock-Up as described in Section 01 4000 - Quality Requirements.

**106 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver materials to Project site in manufacturer's unopened packages or bundles with labels intact.
- B. Store materials in a dry, well-ventilated, weathertight place. Do not store even temporarily on the ground. Comply with manufacturer's written instructions for storage, handling, and protection.
  - 1. Refer to Division 1 Sections "Summary of Work" and "Special Conditions", for additional information and requirements regarding stored materials.

**107 PROJECT CONDITIONS:**

- A. Weather Limitations: Proceed with roof specialty system installation only if existing and forecasted weather conditions permit the systems to be installed according to manufacturer's current written instructions and if substrate is completely dry.

**108 WARRANTY:**

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Project Warranty: Submit a written warranty, executed by roof specialty system manufacturer, agreeing to repair or replace coping and related trim systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 color-difference units as measured according to ASTM D 2244.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

**109 EXTRA MATERIALS:**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - 1. Furnish full lengths of coping system and related trim in a quantity equal to at least 2 percent of amount installed, in whole and unopened packages.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Roof Edge Flashings, Fascias, and Copings:
  - 1. Exceptional Metals : [www.exceptionalmetals.com](http://www.exceptionalmetals.com).
- B. Other manufacturers: The following manufacturers are approved for the project subject to being able to provide the product which meets the specifications and drawings.
  - 1. Architectural Products Co: [www.archprod.com](http://www.archprod.com).
  - 2. Metal-Era Inc: [www.metalera.com](http://www.metalera.com).
  - 3. Metal Roofing Systems, Inc: [www.metalroofingsystems.biz/#sle](http://www.metalroofingsystems.biz/#sle).

**202 COMPONENTS**

- A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.

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1. Configuration: Fascia, cant, and edge securement for roof membrane.
  2. Product equal to 2-Piece Snap-On Compression.
  3. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
  4. Material: Pre-Finished Aluminum-zinc alloy coated steel: ASTM A 792, 55% Aluminum, 43.5% Zinc, 1.5% Silicon Coating ("Galvalume"), with minimum 50,000 p.s.i. yield.
  5. Thickness: 24 gage, 0.024 inch thick, minimum.
  6. Finish: 70 percent polyvinylidene fluoride.
    - a. Color: To be selected by Architect from manufacturer's full range.
  7. Primer: Zinc molybdate type.
- B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
    - a. Brake-metal coping system with continuous clip across top of and length of parapet (full secondary concealed wall cap), with 1-inch high standing seam joints - filled with sealant, double-folded, and corners turned down at 45 degrees.
    - b. Overlap metal minimum 8".
  2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
  3. Material: Pre-Finished Aluminum-zinc alloy coated steel: ASTM A 792, 55% Aluminum, 43.5% Zinc, 1.5% Silicon Coating ("Galvalume"), with minimum 50,000 p.s.i. yield.
  4. Thickness: 24-gauge, 0.024-inch, minimum.
  5. Finish: 3-coat full strength (70-percent) Kynar 500 resin (20 year) finish.
    - a. Color: As selected by Architect from Manufacturer's full range of colors and custom colors.
  6. Primer: Zinc molybdate type.
- C. Scuppers: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
1. Configuration:
    - a. Fabricate scuppers as detailed and in accordance with SMACNA Manual.
  2. Material: Pre-Finished Aluminum-zinc alloy coated steel: ASTM A 792, 55% Aluminum, 43.5% Zinc, 1.5% Silicon Coating ("Galvalume"), with minimum 50,000 p.s.i. yield.
    - a. Finish: 3-coat full strength (70-percent) Kynar 500 resin (20 year) finish.
      - 1) Color: As selected by Architect from Manufacturer's full range of colors.
    - b. Thickness: 22 gage, 0.03 inch thick, minimum.
    - c. Primer: Zinc molybdate type.
- D. Roof Guardrail System:
1. Roof Edge Protection System: Non-penetrating guardrail system. System shall be BlueWater "SafetyRail 2000" [Basis of Design] as specified below, or approved equal in accordance with Section 01 6000 - Product Requirements. Provided product shall be complete, with all required accessories to meet OSHA and Building Code regulations.
  2. System shall have top and midrail in accordance with OSHA Standards - 29 CFR 1910.23 (a)(2).
  3. Structural Load: 200 lb minimum, in any direction to all components in accordance with OSHA Regulation 29 CFR 1926.502.
  4. Height: 42 inches, minimum.
  5. Railings: 1-5/8" O.D. hot rolled pickled electric weld tubing, free of sharp edges and snag points.
  6. Mounting Bases: Class 30 gray iron material cast with four receiver posts. Weight: 108 pounds. Provide rubber pads on bottom of bases.

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7. Receiver Posts: Receiver posts shall have a positive locking system into slots that allow rails to be mounted in any direction. Receiver posts shall have drain holes.
  8. Accessories:
    - a. Toe Board Brackets: Provide brackets and friction knobs.
    - b. Step-Rail: Variable height railing to enable continuous run of guardrail system when roof steps up or down.
    - c. Raised Mid-Rail: Railing to fit over duct work for continuous run of guardrail system.
    - d. LP Outrigger: Supports placed under ducting or conduit to continue run of guardrail system when rail section cannot be used.
    - e. Sliding Gate.
    - f. Finishing Rail: D-shaped railing extension for ladder landings, length of rail section and D-loop as indicated on drawings.
    - g. Safety/Caution Signage: Cushioned foam strip with self adhesive backing; UL - rated for indoor/outdoor use.
      - 1) Product: Safety Strip.
      - 2) Thickness: 3/8".
      - 3) Length: 36".
      - 4) Width: 4 inches.
      - 5) Color: Safety yellow, with black stripes.
    - h. Roof Pads: Provide the following pad under each base to protect roof membrane (Use pad that has same composition as roof membrane.):
      - 1) Product: PVC-KEE Roof Pad.
  9. Hardware: Securing pins of 1010 carbon steel, zinc-plated and yellow chromate dipped. Pins shall consist of collared pin and lanyard that connects to lynch pin.
  10. Collapsible Guard Rails (where indicated): Provide collapsible portable guard rail section with one-way pivot assembly that allows guardrail to fold down to horizontal surface for clean sightlines; requires no penetrations in substrates for installation. Rails shall be compatible with non-collapsible guardrail system.
    - a. Collapsible guard rails shall be BlueWater "Stealth Rail" [Basis of Design], or approved equal in accordance with Section 01 6000 - Product Requirements. Collapsible Guard Rails and Roof Edge Protection System shall be provided by same manufacturer, to assure compatibility.
    - b. Collapsible Guard Rail system shall meet or exceed OSHA Standards 29 CFR 1926.501 and 1926.502.
    - c. Hardware: Detent pin on each pivot assembly shall lock rail in upright position.
  11. Finish: Factory finish powder coat paint. Color: As selected from Manufacturer's full range of colors, and RAL Color Codes.
  12. Warranty: Provide manufacturer's two (2) year warranty from date of substantial completion.
  13. Extent: Where noted on drawings; or where appliances, equipment, fans, roof hatch openings or other components that require service are located within 10 feet of a roof edge or open side of a walking surface, and such edge or open side is located more than 30 inches above the floor, roof or grade below, and where there is not a parapet or other portion of the building that qualifies to provide this protection. Extend the guardrail system no less than 30 inches beyond each end of such appliances, equipment, fan or component.

### **203 ACCESSORIES**

- A. Sealant: Type As specified in Section 07 9010.

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**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that deck, vapor/moisture barrier completion, water-tightness, installation tolerances, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
- B. Examine substrates for compliance with requirements for substrates.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

**302 PREPARATION**

- A. Clean substrates of projections and substances detrimental to application.
- B. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

**303 INSTALLATION**

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

**END OF SECTION**

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**SECTION 07 7123  
MANUFACTURED GUTTERS AND DOWNSPOUTS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Prefinished Aluminum-zinc alloy coated steel gutters and downspouts.
- B. Precast concrete splash pads.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 07 5416 - Ethylene Interpolymer (KEE) Roofing: Flat roofing system.
- C. Section 07 6200 - Sheet Metal Flashing and Trim.
- D. Section 07 7100 - Roof Specialties.

**103 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM A792 / A792M - 09a Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Comply with applicable code for size and method of rain water discharge.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Gutters and Downspouts:
  - 1. ATAS International, Inc; Water Control System: [www.atas.com/#sle](http://www.atas.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Scupper and Collectors:
  - 1. ATAS International, Inc; Scuppers and Collector Boxes: [www.atas.com/#sle](http://www.atas.com/#sle).
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

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**202 MATERIALS**

- A. Pre-Finished Aluminum-zinc alloy coated steel: ASTM A792, 55% Aluminum, 43.5% Zinc, 1.5% Silicon Coating ("Galvalume"). Thickness to comply with SMACNA guidelines, 24 gauge minimum.
- B. Primer: Zinc molybdate type.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Color: Architect to select from manufacturer's full range of premium colors.

**203 COMPONENTS**

- A. Gutters: Profile as indicated; size as indicated.
- B. Downspouts: Plain rectangular profile; size as indicated.
- C. Splash Guards: Inside corner and straight valley guards, of same material as gutters. 3" tall and 16" each direction from corner, or center, of guard.
- D. Anchors and Supports: Profiled to suit gutters and downspouts.
  - 1. Anchoring Devices: Type recommended by fabricator.
  - 2. Gutter Supports: Straps, unless indicated otherwise.
  - 3. Downspout Supports: Brackets, unless indicated otherwise.
    - a. Provide minimum of 3 locations: top, middle and bottom, unless fabricator or SMACNA recommends more. Maximum spacing 10 feet.
  - 4. Material: Same material as gutters and downspouts, unless fabricator recommends otherwise.
- E. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers, unless fabricator recommends otherwise.
- F. Gutter dropouts at each downspout location. Filter screen shall be installed at each downspout location.

**204 ACCESSORIES**

- A. Splash Pads on roof: Built up roof membrane as recommended by roof manufacturer

**205 FABRICATION**

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Provide expansion joints as recommended by SMACNA guidelines, and in locations that will not hinder drainage.
- E. Hem exposed edges of metal.
- F. Fabricate gutter and downspout accessories; seal watertight.

**206 FINISHES**

- A. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors (Full range of premium colors).
- B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

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**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that surfaces are ready to receive work.

**302 PREPARATION**

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

**303 INSTALLATION**

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions, or industry standards (see Reference Standards above).
- B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- C. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
- D. Install splash guards on gutters at bottom of all valleys, in accordance with manufacturer's directions.
- E. Set splash pads under downspouts on roof.

**END OF SECTION**



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**SECTION 07 7200  
ROOF ACCESSORIES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Roof curbs.
- B. Equipment rails.
- C. Roof penetrations mounting curbs.
- D. Rooftop equipment screens.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 07 5416 - Ethylene Interpolymer [KEE] Roofing: Flat Roof.
- C. Section 07 7100 - Roof Specialties: Other manufactured roof specialty items.
- D. Section 08 3100 - Access Doors and Panels: Attic Hatch.

**103 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

**104 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

**105 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

**PART 2 - PRODUCTS**

**201 ROOF CURBS**

- A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
  - 1. Roof Curb Mounting Substrate: Curb substrate consists of flat roof deck sheathing with insulation.
  - 2. Sheet Metal Material:
  - 3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gauge, 0.048 inch thick.
  - 4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches.
  - 5. Provide layouts and configurations indicated on drawings.

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- B. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
    - 1. Provide preservative treated wood nailers along top of curb.
    - 2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
    - 3. Height Above Finished Roof Surface: 8 inches, minimum above finished roof surface.
  - C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
  - D. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.

**202 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION**

- A. Roof Hatch Manufacturers:
  - 1. Babcock-Davis; ThermalMAX: [www.babcockdavis.com/#sle](http://www.babcockdavis.com/#sle).
  - 2. Bilco Company: [www.bilco.com](http://www.bilco.com).
  - 3. Nystrom: [www.nystrom.com](http://www.nystrom.com).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
  - 1. Style: Provide flat metal covers unless otherwise indicated.
  - 2. Fire-Rated.
  - 3. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
- C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
  - 1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch thick.
  - 2. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
  - 3. Curb Height: As indicated on drawings.
- D. Metal Covers: Flush, insulated, hollow metal construction.
  - 1. Capable of supporting 40 psf live load.
  - 2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch thick, liner 0.04 inch thick.
  - 3. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
  - 4. Gasket: Neoprene, continuous around cover perimeter.
- E. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
  - 1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
  - 2. Hinges: Heavy duty pintle type.
  - 3. Hold open arm with vinyl-coated handle for manual release.
  - 4. Latch: Upon closing, engage latch automatically and reset manual release.
  - 5. Manual Release: Pull handle on interior.

**203 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES**

- A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
  - 1. Design Loadings and Configurations: As required by applicable codes.
  - 2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.

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3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
  5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

**204 ROOFTOP EQUIPMENT SCREENS**

- A. Rooftop Equipment Screens: As indicated in the drawings.
  1. Design Loadings and Configurations: As required by applicable codes.
  2. Height: As indicated in the drawings.
  3. Roof Penetrations: As indicated in the drawings. See Section 07 5416 for KEE roofing accessories.
  4. Steel Components: As indicated in the drawings.
  5. Steel Components Finish: See Section 09 9100 Painting
  6. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**302 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

**303 INSTALLATION**

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

**304 CLEANING**

- A. Clean installed work to like-new condition.

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**SECTION 07 8400  
FIRESTOPPING**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

**1.02 DESCRIPTION OF WORK**

- A. Work described in this Section includes:
1. Through penetration firestopping in fire rated construction.
  2. Construction-gap firestopping at connections of the same materials and different materials in fire rated construction.
  3. Construction-gap fire stopping occurring within fire rated wall, floor, floor-ceiling, and/or roof-ceiling assemblies.
  4. Construction-gap firestopping at the top of fire rated walls.
  5. Through-penetration smoke-stopping in smoke partitions.
  6. Construction-gap smoke-stopping in smoke partitions.
- B. Related work Specified elsewhere includes:
1. For structural, finish, and fire protection materials: Refer to the appropriate Specifications Sections.
  2. Fire dampers and manufactured devices: Refer to Divisions 21-23.
  3. Raceway seals and manufactured electrical devices: Refer to Division 26.
- C. Unless specifically indicated otherwise, the party, trade, or subcontractor whose work penetrates fire-rated construction and/or fire-rated assemblies, shall be responsible for firestopping around their own penetrations.
- D. In the event the General Contractor employs a Specialty Subcontractor for the required firestopping work, they shall notify all prospective Bidders, so as to avoid duplication in pricing.
1. The Specialty Subcontractor shall provide coordination of requirements and the related work of other trades in advance of and as the Work progresses.

**1.03 REFERENCED STANDARDS**

- A. Underwriters Laboratories - U.L. Fire Resistant Directory:
1. Through-penetration fire stop devices (XHCR); Firestop Devices (XHJI).
  2. Fire resistant ratings (BXUV) (BXRH).
  3. Through-penetration firestop systems (XHEZ).
  4. Fill, void, or cavity material (XHHW).
  5. Joint Systems (XHBN) & Perimeter Fire Containment Systems (XH DG).
- B. American Society for Testing and Materials Standards:
1. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
  2. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
  3. ASTM E 1966: Standard Test Method for Fire Resistive Joints Systems.
  4. ASTM E 2307: (Perimeter).
- C. Underwriters Laboratories, Inc.:
1. UL 1479: Fire Tests of Through-Penetration Firestops.
  2. UL 2079: Tests for Fire Resistance of Building Joint Systems.
  3. UL 723: Surface Burning Characteristics of Building Materials.

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- D. NFPA 101 - Life Safety Code / NFPA 70 - National Electrical Code.

**1.04 DEFINITIONS**

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated fire walls, smoke barrier walls, time rated floor-ceiling and roof-ceiling assemblies, and structural floors and walls.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses, and smoke.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc., to close specific barrier penetrations.
- G. Sleeve: Metal fabrication or metal pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

**1.05 SYSTEM DESCRIPTION**

- A. Design Requirements:
1. Fire Rated Construction: Maintain barrier and structural floor fire ratings including resistance to cold smoke at all penetrations, connections with other surfaces and/or types of construction, at separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.
  2. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.

**1.06 SUBMITTALS**

- A. Submit in accordance with General Conditions, and Division 1, unless specifically indicated otherwise.
- B. Product Data: Manufacturer's written specifications and technical data including the following:
1. Detailed specifications of construction and fabrication.
  2. Manufacturer's current written installation instructions.
  3. Summary of test data for each product intended for use and limitations. Include name and address of the required independent testing laboratory and compliances obtained.
- C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
1. Details of each proposed assembly identifying intended products and applicable UL System number or UL Classified devices.
  2. Manufacturer or manufacturers representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.
- D. Quality Control Submittals: Statement of qualifications.
- E. Applicators' Qualifications Statement: List past projects indicating required experience.

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**107 QUALITY ASSURANCE**

- A. Specialty Contractor's Qualifications: Firm experience in installation or application of systems similar in complexity to those required for this project, plus the following:
  - 1. Acceptable to or licensed by manufacturer, and to State, Local, and/or other authority having jurisdiction, where applicable.
  - 2. At least 2-years experience with systems intended for use.
  - 3. Successfully completed at least five projects of similar size, scope, and complexity using the systems intended for use.
- B. Local and State Regulatory Requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System Numbers or UL classified devices and/or systems. Engineering judgment documents must follow requirements set forth by the International Firestop Council.
- C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

**108 DELIVERY, STORAGE AND HANDLING**

- A. Packing and Shipping:
  - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
  - 2. Coordinate delivery with scheduled installation date, so as to allow minimum storage at site.
- B. Storage and Protection: Store materials in a clean, dry, ventilated interior location. Store materials off of floor, and protect from soiling, abuse, moisture, and freezing. Follow manufacturer's written instructions when more stringent.
- C. Remove damaged and/or contaminated materials immediately, legally dispose of off site, and Replace, at Contractor's expense.

**109 PROJECT CONDITIONS**

- A. Existing Conditions:
  - 1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding with work.
  - 2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.
- B. Environmental Requirements:
  - 1. Furnish adequate ventilation if using solvents.
  - 2. Furnish forced air ventilation during installation if required by manufacturer and/or authorities having jurisdiction.
  - 3. Keep Flammable materials away from sparks or flame.
  - 4. Provide masking or drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
  - 5. Comply with manufacturer's written recommendations for temperature and humidity conditions before, during, and after installation of firestopping.

**110 GUARANTEE**

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasive resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, and/or general durability, and/or which appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality or characteristic of the material for the exposure indicated. The guarantee period shall be for 1-year from the date of "Substantial Completion."



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**PART 2 - PRODUCTS**

**201 ACCEPTABLE MANUFACTURERS AND PRODUCTS**

- A. Use only those listed in the UL Fire Resistance Directory for the UL System involved.
- B. Products shall be as manufactured by one of the following , or pre-approved equivalent:
  - 1. Dow Corning.
  - 2. HILTI.
  - 3. 3M Fire Protection Products.
  - 4. Nelson Firestop Products.
  - 5. Rector Seal Corp.; "Bio Fireshield", "Biostop", "Biotherm", "Metacaulk", "Track-Safe", [Basis of Design]: [www.rectorseal.com](http://www.rectorseal.com).
  - 6. Specified Technologies, Inc.
  - 7. Tremco, Div. of RPM Corporation.
- C. All firestopping products must be from a single manufacturer.
- D. All trades shall use products from the same manufacturer.

**202 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION**

- A. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR (XHJI) and XHEZ may be used, providing that they conform to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
  - 1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designated to perform this function.

**203 CONSTRUCTION-GAP FIRE STOPPING OF FIRE-RATED CONSTRUCTION**

- A. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.
- B. Firestopping at construction gaps between tops of partitions and under side of structural systems.
- C. Firestopping at construction gaps between tops of partitions and underside of fire-rated ceiling or ceiling assembly.
- D. Firestopping of control joints in fire rated masonry partitions.
- E. Firestopping expansion joints.
- F. Acceptable manufacturers and products: Use only those listed in the UL Fire Resistant Directory for the UL System involved.

**204 SMOKE STOPPING AT SMOKE PARTITIONS**

- A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded, as applicable.
- B. Construction-gap smoke-stopping: Any system complying with the requirement for construction-gap firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide the smoke seal. The length of time of the fire resistance may be disregarded, as applicable.

**205 ACCESSORIES**

- A. Fill, void, and cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.

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- B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Notify the General Contractor of such conditions.
1. Verify barrier penetrations are properly sized and in suitable conditions for application of materials.
  2. Do not proceed with the work until unsatisfactory conditions have been corrected.

**302 PREPARATION AND CLEANING**

- A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances, that may effect proper fitting, adhesion, or the required fire resistance.

**303 INSTALLATION**

- A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's written instructions and recommendations.
- B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- C. Where floor openings without penetrating items are more than 4-inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as required for floor system.
- D. Protect materials from damage on surfaces subject to traffic.
- E. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges, which are to be installed in accordance with fire damper manufacturer's written recommendations, unless specifically indicated otherwise.
- F. Where large openings are created in walls, or floors to permit installation of pipes, ducts, cable tray, bus duct, or other items, close unused portions of opening with firestopping material tested for the application.
- G. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12-inch wide fiber dams for full thickness and height of air cavity at maximum intervals of 15'-0" on center.

**304 FIELD QUALITY CONTROL**

- A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by the Architect, building inspector, fire inspector, and/or other authority having jurisdiction.
- C. Perform under this Section patching and repairing of firestopping caused by cutting or penetration by other trades, and/or by any other cause.

**305 ADJUSTING AND CLEANING**

- A. Immediately clean-up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials and debris, leaving area in undamaged and clean condition.
- D. Legally dispose of excess materials, trash, debris, etc., off of site.

**END OF SECTION**

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**SECTION 07 9010  
JOINT SEALERS**

**PART 1 - GENERAL**

**101 SUMMARY**

- A. Section Includes:
1. Exterior Silicone and Polyurethane Sealants.
  2. Exterior and Interior Polyurethane Traffic Sealants.
  3. Interior Silicone and Polyurethane Sealants.
  4. Interior Latex Joint Sealers.
  5. Metal lap joint sealants.
  6. Threshold and sheet metal bedding sealants.
  7. Acoustic Sealant.
  8. Joint Accessories.

**102 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
1. Section 01400 - Quality Requirements: General requirements for mock-ups.
  2. Section 03300 - Cast-In-Place Concrete.
  3. Section 03 3000 - Concrete.
  4. Section 04 2000 - Unit Masonry Assemblies.
  5. Section 07 4213 - Metal Wall Panels
  6. Section 07 4213.02 - Metal Composite Material (MCM) Wall Panels
  7. Section 07 4646 - Fiber Cement Siding
  8. Section 07 1400 - Fluid-Applied Air Barrier: Sealants required in conjunction with substrates for fluid-applied waterproofing.
  9. Section 07 6200 - Sheet Metal Flashing and Trim.
  10. Division 8 - Doors and Windows.
  11. Section 08 8000 - Glazing: Glazing sealants and protective glazing systems.
  12. Section 09 2116 - Gypsum Board Assemblies.
  13. Section 09 3000 - Tile.
  14. Section 09 5100 - Suspended Acoustical Ceilings.
  15. Section 09 9100 - Paints and Coatings.
  16. Divisions 15 and 16 - (Joint sealers for mechanical and electrical work)

**103 REFERENCE STANDARDS**

- A. ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
- B. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
- C. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- D. ASTM C834 - Standard Specification for Latex Sealants.
- E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C 1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

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- G. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
  - H. ASTM C 1247 - Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
  - I. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
  - J. ASTM C 1311 - Standard Specification for Solvent Release Sealants.
  - K. ASTM D 2203 - Standard Test Method for Staining from Sealants.

**104 DESCRIPTION OF WORK**

- A. Work described in this section includes joint sealer systems.

**105 SYSTEM PERFORMANCES**

- A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

**106 SUBMITTALS**

- A. Product Data: Submit manufacturer's complete product specifications, handling/installation/curing instructions, color charts and performance tested data sheets and field / lab results for each product required.

**107 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an Installer who has successfully completed within the last three years at least 3 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.
- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.
- C. Mock-Up:
  - 1. As indicated on drawings.
  - 2. Coordinate with work of other Sections.
  - 3. Locate where directed.
  - 4. Mock-up may not remain as part of the Work.

**108 DELIVER, STORAGE AND HANDLING**

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

**109 PROJECT CONDITIONS**

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 degrees F.
  - 2. When joint substrates are wet due to rain, frost, condensation or other causes.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

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**PART 2 - PRODUCTS**

**201 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- B. Colors: Provide color of exposed joint sealers indicated, or if not indicated, as selected by Architect from manufacturer's full range of custom colors.

**202 ELASTOMERIC JOINT SEALANTS**

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
- B. Multi-Part Nonsag Urethane Sealant: Type M, Grade NS, Class 25, Uses NT, M, A and, as applicable to joint substrates indicated, O.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Dynatrol 11" One-part; Pecora Corp.
    - b. "Sonolastic NP-2" Multi-component; Sonneborn.
    - c. "Dymeric 240/240FC" Multi-component; Tremco, Inc.
  - 2. Locations for Use: Exterior joints and penetrations in vertical surfaces of concrete, and between metal and concrete, mortar or stone; overhead or ceiling joints; perimeters of metal frames in exterior walls; vertical expansion and control joints in masonry and concrete; and at all miscellaneous locations requiring a joint sealant.
  - 3. Equivalent 1-part sealants will be acceptable for interior surfaces only, by one of the above named manufacturers.
- C. Two-Part Pourable Urethane Sealant (Horizontal): Type M, Grade P, Class 25; Uses T, M, A and, as applicable to joint substrates indicated, O.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Vulkem 45SSL"; Tremco, Inc.
    - b. "Pourthane"; W. R. Meadows, Inc.
    - c. "NR-200 Urexpan"; Pecora Corp.
    - d. "Sonolastic Paving Joint Sealant"; BASF Building Products Div.,
    - e. "THC-900/901"; Tremco, Inc.
  - 2. Locations for Use: Exterior and interior expansion, control and construction joints in horizontal surfaces; and joints subject to pedestrian and light vehicular traffic.
  - 3. Equivalent 1-part sealants will be acceptable for joints in exterior concrete paving only by one of the above named manufacturers.
- D. One-Part Mildew-Resistant Silicone Sealant: Type S, Grade NS; Class 25, Uses NT, G, A and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Dow-Corning 786"; Dow Corning Corp.
    - b. "SCS 1702"; General Electric.
    - c. "863 #345 White"; Pecora Corp.
    - d. "Tremsil 200"; White, Clear; Tremco, Inc.
  - 2. Locations for Use: Interior joints in vertical surfaces and terminal edges of tile; showers, baths, and joints at damp areas, such as around sinks and plumbing fixtures and pipe penetrations; and exposed terminal edges of vinyl flooring, such as around door frames and terminations at concrete.

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- E. Pre-Compressed Polyurethane Foam Sealant: Tremco "illmod 600": Expandable sealant for use between CMU wall and a floor slab, and at other similar locations or where noted. Color: black.
  - F. Expansion (High Movement) Joint Sealants: One part, neutral cure silicone material: Dow Corning 790 Silicone Building Sealant, or Tremco, Inc. Spectrem 1, Spectrem 3, Spectrem 4 TS (Tintable System). Type S, Grade NS, Class +/- 50. Uses NT, M, G, O.
  - G. Masonry:
    - 1. Silicone, non-staining, neutral curing:
      - a. "Spectrem 1", "Spectrem 3", or "Spectrem 4-TS" - Tintable System; Tremco, Inc.
      - b. Dow "790".
      - c. Pecora "890".

### **203 LATEX JOINT SEALERS**

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part nonsag, acrylic, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than + 7.5%.
  - 1. Products: Subject to compliance with requirements, provide with one of the following:
    - a. "Chem-Calk 600"; Bostik Construction Products Div.
    - b. "AC-20"; Pecora Corp.
    - c. "Sonolac"; Sonneborn Building Products Div; Rexnord Chemical Prod., Inc.
    - d. "Tremflex 834"; Tremco Inc.
  - 2. Locations for Use: Interior joints in field-painted vertical and overhead surfaces at perimeter of metal door frames, gypsum drywall, plaster and concrete or concrete masonry; and all other interior locations not indicated otherwise.

### **204 ACOUSTIC SEALANT**

- A. Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
  - 1. Applications: Use for concealed locations only:
    - a. Sealant bead between top stud runner and structure and between bottom stud track and floor.

### **205 FIRE-RESISTANT JOINT SEALERS**

- A. Refer to Section 07 8400 - "Firestopping," for additional information and detailed requirements.

### **206 JOINT SEALANT BACKING**

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint-Fillers:
  - 1. Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
  - 2. Backer Rod: Premium grade, closed cell polyethylene foam rod; Sealtight Backer Rod, as manufactured by W.R. Meadows, Inc., or approved equivalent.
  - 3. Joint Filler: "Ceramar" flexible foam expansion joint filler, as manufactured by W.R. Meadows, Inc., or approved equivalent.
    - a. Thickness: 1/4".
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint.

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Provide self-adhesive tape where applicable.

**207 MISCELLANEOUS MATERIALS**

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surface adjacent to joints.
- D. Expansion Joint Filler: Multi-purpose, Expansion-Contraction Joint Filler for slab joints. Thickness: 1/2 inch, unless indicated otherwise. Equal to W.R.Meadows Fibre Expansion Joint.

**PART 3 - EXECUTION**

**301 INSPECTION**

- A. Require Installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer work to proceed until unsatisfactory conditions have been corrected.

**302 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
  - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- D. Perform field sealant adhesion testing prior to beginning work to verify substrate preparation and priming requirements.

**303 INSTALLATION OF JOINT SEALERS**

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.



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- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
  - C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.
  - D. Installation of Sealant Backings:
    - 1. Install sealant backings to comply with the following requirements:
    - 2. Install joint-fillers of type indicated or recommended by sealant manufacturer to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
      - a. Do not leave gaps between ends of joint-fillers.
      - b. Do not stretch, twist, puncture or tear joint-fillers.
      - c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
    - 3. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.
  - E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
  - F. Perform acoustical sealant application work in accordance with ASTM C 919.
  - G. Tooling of Nonsag Sealants:
    - 1. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
    - 2. Concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

### **304 PROTECTION AND CLEANING**

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

**END OF SECTION**

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**SECTION 07 9100  
PREFORMED JOINT SEALS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Precompressed foam seals.
- B. Compression gaskets.
- C. Preformed strip seals.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.
- B. Section 07 9200 - Joint Sealants: Liquid and mastic joint sealants and their backing materials.

**103 REFERENCE STANDARDS**

- A. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's technical data sheets for each product, including chemical composition, movement capability, color availability, limitations on application, and installation instructions.
- C. Color Cards: For color selection.
- D. Samples for Color Selection: 4 inch long pieces of each color available; at least 2 samples of each color.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section with at least three years of documented experience.

**106 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealers that fail to achieve watertight seal or exhibit loss of adhesion or cohesion.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Precompressed Foam Seals:
  - 1. Balco, Inc; Wall Compression Seals (BCSW): [www.balcousa.com/#sle](http://www.balcousa.com/#sle).
  - 2. EMSEAL Joint Systems, Ltd: [www.emseal.com/#sle](http://www.emseal.com/#sle).
  - 3. Nystrom, Inc: [www.nystrom.com/#sle](http://www.nystrom.com/#sle).
  - 4. Tremco Commercial Sealants & Waterproofing: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - 5. Watson Bowman Acme Corporation: [www.watsonbowmanacme.com/#sle](http://www.watsonbowmanacme.com/#sle).

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**202 PRECOMPRESSED FOAM SEALS**

- A. Precompressed Foam Seal: Comprised of urethane, modified-acrylic impregnated, or closed-cell neoprene foam impregnated with water-repellent, and with self-adhesive faces protected prior to installation by release paper.
  - 1. Color: As selected by Architect from full range of premium colors.
  - 2. Size as required to provide water-tight seal when installed.
  - 3. Calculate size according to manufacturer's recommendations.
  - 4. Measure size of existing joints before selecting seal width.
  - 5. Provide product recommended by manufacturer for traffic-bearing use.
  - 6. Applications:
    - a. Exterior wall expansion joints.
  - 7. Manufacturers:
    - a. EMSEAL Joint Systems, Ltd; DSM System: [www.emseal.com/#sle](http://www.emseal.com/#sle).
    - b. Tremco Commercial Sealants & Waterproofing; ExoAir Eco: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
    - c. Watson Bowman Acme Corporation; Wabo InverSeal (IV): [www.watsonbowmanacme.com/#sle](http://www.watsonbowmanacme.com/#sle).
- B. Precompressed Foam Seal, Fire-Retardant Impregnated: Comprised of waterproof silicone faces on each side of fire-retardant impregnated foam sealant.
  - 1. Color: As selected by Architect.
  - 2. Size as required to provide water-tight seal when installed.
  - 3. Calculate size according to manufacturer's recommendations.
  - 4. Fire-Rating: As indicated on drawings, comply with UL 2079.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that joints are ready to receive this work.
- B. Measure joint dimensions and verify that seal products are of the correct size to properly seal the joints.

**302 PREPARATION**

- A. Properly prepare construction components adjacent to the work of this section to prevent damage and disfigurement due to this work.

**303 INSTALLATION**

- A. Install in accordance with manufacturer's written instructions.
- B. Precompressed Foam Seals:
  - 1. Install only when ambient temperature is within recommended application temperature range of adhesive. Consult manufacturer when installing outside this temperature range.
  - 2. Prepare joints and install seals in accordance with manufacturer's written recommendations.
  - 3. Remove loose materials and foreign matter that could impair adhesion of sealant.
  - 4. Do not stretch precompressed seal; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
- C. Compression Gaskets:
  - 1. Install only when ambient temperature is within recommended application temperature range of adhesive. Consult manufacturer when installing outside this temperature range.
  - 2. Prepare joints and install seals in accordance with manufacturer's written recommendations.
  - 3. Remove loose materials and foreign matter that could impair adhesion of sealant.

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4. Avoid joints except at ends, corners, and intersections; seal joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

**304 CLEANING**

- A. Clean adjacent soiled surfaces.

**305 PROTECTION**

- A. Protect joints from damage until adhesives have properly cured.

**END OF SECTION**

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**SECTION 07 9513  
EXPANSION JOINT COVER ASSEMBLIES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Expansion joint cover assemblies for floor, wall, and ceiling surfaces.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3100 - Concrete.
- C. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.
- D. Section 05 5000 - Metal Fabrications: Custom fabricated metal expansion and control joint devices.
- E. Section 07 6200 - Sheet Metal Flashing and Trim: Roof expansion and control joint covers.
- F. Section 07 9005 - Joint Sealers: Expansion and control joint finishing utilizing a sealant and bond breaker.
- G. Section 09 2116 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.
- H. Section 09 5100 - Acoustical Ceilings: Expansion joint assemblies in suspended ceiling grids.

**103 REFERENCE STANDARDS**

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.
- E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.
- F. LEED Submittals:
  - 1. For joint cover assemblies, submit documentation of recycled content and location of manufacture.
  - 2. For steel products, submit documentation of steel mill process, location of mill and location of manufacture.

**105 QUALITY REQUIREMENTS**

- A. Installer Qualifications: Approved by manufacturer.
- B. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 and/or ASTM E 1966

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by a testing and inspecting agency acceptable to authorities having jurisdiction. Fire rating not less than the rating of adjacent construction.

- C. Manufacturer shall provide 5 year warranty for all joint covers.

## **PART 2 - PRODUCTS**

### **201 MANUFACTURERS / PRODUCTS**

- A. Expansion Joint Cover Assemblies:
1. Architectural Art Mfg, Inc: [www.archart.com/#sle](http://www.archart.com/#sle).
  2. Balco, Inc.: [www.balcousa.com](http://www.balcousa.com).
  3. Construction Specialties, Inc: [www.c-sgroup.com/#sle](http://www.c-sgroup.com/#sle). (BASIS OF DESIGN)
    - a. Floor, Interior: Monoflex
    - b. Wall to Wall, Exterior: VF / VFR / HFR
    - c. Wall to Wall, and Ceiling to Ceiling: Interior face of Exterior and Interior Wall and Ceiling: ASM
    - d. Interior Corner Wall: ASM
  4. Inpro: [www.inprocorp.com](http://www.inprocorp.com).
  5. MM Systems Corp; \_\_\_\_\_: [www.mmsystemscorp.com/#sle](http://www.mmsystemscorp.com/#sle).
  6. Nystrom, Inc; \_\_\_\_\_: [www.nystrom.com/#sle](http://www.nystrom.com/#sle).
  7. Substitutions: See Section 01 6000 - Product Requirements.

### **202 EXPANSION JOINT COVER ASSEMBLIES**

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
1. Joint Dimensions and Configurations: As indicated on drawings.
  2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
  3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
  4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

### **203 MATERIALS**

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
1. Exposed Finish Outdoors: Natural anodized.
  2. Exposed Finish at Floors: Mill finish or natural anodized.
  3. Exposed Finish at Walls and Ceilings: Natural anodized.
- B. Resilient Filler: Neoprene, exhibiting Shore A hardness of 40 to 50 Durometer.
- C. Threaded Fasteners: Stainless steel.
- D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

### **204 FABRICATION**

- A. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient neoprene filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush mounted.
- B. Back paint components in contact with cementitious materials.
- C. Galvanize embedded ferrous metal anchors and fastening devices.

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- D. Shop assemble components and package with anchors and fittings.
  - E. Provide joint components in single length wherever practical. Minimize site splicing.
  - F. Provide with stainless steel foil insulation for fire barrier as needed to achieve fire-rating where required.

**205 FINISHES**

- A. Floors: Mill finish.
- B. Walls and Ceilings: Clear anodized.
- C. Seal Material: Color as selected by Architect from manufacturer's standard range.
- D. Resilient Filler Exposed to View: Gray.
- E. Exterior Walls to Wall: Color as selected for Silicone coating.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

**302 INSTALLATION**

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

**303 PROTECTION**

- A. Do not permit traffic over unprotected floor joint surfaces.
- B. Provide strippable coating to protect finish surface.

**END OF SECTION**



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**SECTION 08 1113  
STEEL DOORS AND FRAMES**

**PART 1 - GENERAL**

**401 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Hollow metal borrowed lites glazing frames.
- E. Accessories.

**402 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 08 7100 - Door Hardware.
- C. Section 09 9100 - Painting: Field painting.

**403 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- J. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- M. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).
- N. ITS (DIR) - Directory of Listed Products; Current Edition.
- O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

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- Q. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
  - R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
  - S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
  - T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
  - U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
  - V. UL (DIR) - Online Certifications Directory; Current Edition.
  - W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

**404 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any. Show anchorage and accessory items.
- D. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
- E. Coordinate glazing frames and stops with glass and glazing requirements.
- F. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- G. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

**405 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- C. Provide steel doors and frames from a single manufacturer.
- D. Fire-Rated Door Assemblies:
  - 1. Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows," and have been tested, listed and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
  - 2. Labels mounted on doors and door frames must indicate the time rating of the door/frame assembly.
  - 3. Provide units listed and labeled by UL.
  - 4. Attach fire rating label to each fire-rated unit.
  - 5. Fire rating label must be accessible, permanent (embossed on metal label), and be kept legible at all times.
  - 6. Labels on frames with transoms or sidelights must identify that the opening assembly includes same.

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**406 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
- C. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.
- D. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equivalent in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- E. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

**PART 2 - PRODUCTS**

**501 MANUFACTURERS**

- A. Steel Doors and Frames, (General):
  - 1. Ceco Door: [www.cecodoor.com](http://www.cecodoor.com).
  - 2. Mesker Industries, Inc.
  - 3. Republic Builders Products Corp./Subs. Republic Steel.
  - 4. Steelcraft, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
- B. Substitutions: Section 01 6000 - Product Requirements.

**502 PERFORMANCE REQUIREMENTS**

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
  - 4. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
  - 5. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.
- B. Materials:
  - 1. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
  - 2. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM SA 568.

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3. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G90 zinc coating, mill phosphatized.
  4. Supports and Anchors: Fabricate of galvanized sheet steel of gage not less than that of door frame.
  5. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- C. Fabrication:
1. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site.
  2. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
  3. Fabricate exterior doors, panels and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels.
    - a. Use galvanizing repair paint for surfaces damaged by fabrication or welding.
  4. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
  5. Finish Hardware Preparation:
    - a. Prepare doors and frames to receive mortise and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.
    - b. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
    - c. Locate finish hardware as indicated on final shop drawings, or if not indicated, in accordance with "Recommended Locations for Builders' Hardware," published by Door and Hardware Institute.
  6. Shop Painting:
    - a. Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
    - b. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.
    - c. Use galvanizing repair paint for surfaces damaged by fabrication or welding, prior to prime coat.
    - d. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
    - e. Do not paint fire labels on doors or frames.
- D. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### **503 HOLLOW METAL DOORS**

- A. Provide metal doors of types and styles indicated on drawings or schedules, or seamless hollow steel construction. Form exterior doors of hot dip galvanized steel.
- B. Exterior Doors, Non-Fire-Rated:
  1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

- 
- a. Level 3 - Extra Heavy-duty.
  - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
  - c. Model 1 - Full Flush.
  - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
  2. Core Material: Polystyrene, 1 lbs/cu ft minimum density.
  3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
  4. Door Face Sheets: Flush.
- C. Interior Doors, Non-Fire Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 2 - Heavy-duty.
    - b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
  2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  3. Door Thickness: 1-3/4 inches, nominal.
  4. Door Face Sheets: Flush.
  5. Door Finish: Factory primed and field finished.
- D. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 2 - Heavy-duty.
    - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
  2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
    - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - b. Attach fire rating label to each fire rated unit.
  3. Core Material: Mineral board.
  4. Door Thickness: 1-3/4 inches, nominal.
  5. Door Face Sheets: Flush.
  6. Door Finish: Factory primed and field finished.

**504 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. General:
  1. Comply with the requirements of grade specified for corresponding door, except:
    - a. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricated frames of minimum 16-gauge cold-rolled furniture steel for interior door frames; 14-gauge cold-rolled furniture steel for exterior door frames.
  2. Frames shall be formed by press brake with corners sharp and true. Corners shall be mitered and accurately fitted, and shall be fully electrically welded and then ground smooth. Removable spreaders shall be welded to the bottom of the frame. Frames shall be accurately mortised for hardware.
  3. Contractor shall verify width of throat opening required, before fabrication.

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4. A minimum of three wall anchors shall be provided at each jamb, except four at doors 7'-10" high or more, and six at doors 10-foot high or more. Anchors shall be attached to door frames, adjustable, suitable for wall conditions and job requirements, and shall be 16 gauge minimum. Floor anchors shall be provided and welded to foot of each jamb with two 5/16" holes for securing to the floor.
  5. Reinforcements of adequate gauge shall be provided for strikes, closers and brackets and other surface applied hardware for field drilling and tapping.
- C. Exterior Door Frames: Fully welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
  2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
  3. Frame Finish: Factory primed and field finished.
  4. Weatherstripping: Separate, see Section 08 7100.
- D. Interior Door Frames: Fully welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  2. Frame Finish: Factory primed and field finished.
- E. Interior Door Frames, Fire-Rated: Fully welded type.
1. Fire Rating: Same as door, labeled.
  2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
  3. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  4. Frame Finish: Factory primed and field finished.
- F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

#### **505 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

#### **506 ACCESSORIES**

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
  1. Provide prefinished louvers according to SDI 111C, at locations indicated, with blades or baffles formed of 0.0239-inch (0.6-mm) thick cold-rolled steel sheet set into minimum 0.0359-inch (0.9-mm) thick steel frame; Galvanized at exterior.
  2. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.
  3. Louvers in exterior doors: Provide removable bird screens for exterior louvers.
    - a. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated.
    - b. Provide frames consisting of U-shaped metal for permanently securing screen mesh.
    - c. Use 1/4-inch x 1/4-inch mesh formed with 0.063-inch diameter aluminum wire.
    - d. Color: To match louver, or black.

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- e. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12-inch o.c. between.
  - 4. Style: Sightproof inverted Y blade.
  - 5. Fasteners: Exposed or concealed fasteners.
  - 6. Finish:
    - a. Surface Preparation: Solvent clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
    - b. Pretreatment: Immediately after surface preparation, apply conversion coating of type suited to organic coating applied over it.
    - c. Baked Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat baked enamel finish, consisting of prime coat and thermosetting topcoat that complies with ANSI A250.3. Comply with paint manufacturer's current written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.0508 mm).
    - d. Color and Gloss: As selected by Architect from manufacturer's full range of choices for standard non-metallic colors and gloss.
  - B. Glazing: As specified in Section 08 8000 - Glazing.
  - C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
  - D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
  - E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
    - 1. Provide additional door silencers at doors over 3'-0" wide or 7'-0" in height.
    - 2. Provide silencers equivalent to "GJ64" silencers as manufactured by Glenn-Johnson Corp., for metal frames, when not provided under the work of Section 08 7100 - "Finish Hardware."
  - F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

#### **5.07 FINISHES**

- A. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating. This coating shall be factory installed on all interior of all hollow metal frames. Field application is not acceptable.

### **PART 3 - EXECUTION**

#### **6.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

#### **6.02 PREPARATION**

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

#### **6.03 INSTALLATION**

- A. General: Install standard steel doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.



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- B. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
  - C. Install fire rated units in accordance with NFPA 80.
  - D. Coordinate frame anchor placement with wall construction.
  - E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
  - F. Placing Frames:
    - 1. Comply with provisions of SDI-1-06 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.
    - 2. Remove before installation all spreader bars and braces used for shipping.
    - 3. Except for frames located at in-place concrete or masonry, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces leaving surfaces smooth and undamaged.
    - 4. In masonry construction, locate a minimum of 3 wall anchors per jamb at hinge and strike levels. Add 1 wall anchor per jamb at hinge and strike levels for each whole 1'-10" height increment over 6'-0"; Similar at glazed and cased openings.
    - 5. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
    - 6. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws. Add additional anchors as indicated in paragraphs above.
    - 7. Install fire-rated frames in accordance with NFPA Std. No. 80
  - G. Door Installation:
    - 1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
    - 2. Place fire-rated doors with clearances as specified in NFPA Std. No. 80.
  - H. Install silencers after all painting of doors and frames has been completed.
  - I. Install door hardware as specified in Section 08 7100.
  - J. Comply with glazing installation requirements of Section 08 8000.
  - K. Coordinate installation of electrical connections to electrical hardware items.

**604 TOLERANCES**

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

**605 ADJUSTING**

- A. Adjust for smooth and balanced door movement.
- B. Prime Coat Touch-up:
  - 1. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
  - 2. Use galvanizing repair paint for galvanized surfaces, prior to prime coat.
- C. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.
- D. Repair all dents, bends, and prying prior to painting.

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**606 SCHEDULE**

- A. Refer to Door and Frame Schedule on the drawings.

**END OF SECTION**

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**SECTION 08 1116  
ALUMINUM DOORS AND FRAMES**

**PART 2 PRODUCTS**

**101 DOORS AND FRAMES**

- A. Dimensions and Shapes: As indicated on drawings; dimensions indicated are nominal.
  - 1. Provide the following clearances:
    - a. Hinge and Lock Stiles: 1/8 inch.
    - b. Between Meeting Stiles: 1/4 inch.
    - c. At Top Rail and Bottom Rail: 1/8 inch.

**102 COMPONENTS**

**END OF SECTION**

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**SECTION 08 1416  
FLUSH WOOD DOORS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Flush wood doors; flush configuration; fire rated and non-rated.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 08 1113 - Steel Doors and Frames.
- C. Section 08 7100 - Finish Hardware.
- D. Section 08 8000 - Glazing.

**103 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.
- D. Samples: Submit two samples of stain colors, 6 x 6 inches minimum - on actual veneer chosen, for Architect to use to select stain color.
- E. Verification Samples: Submit two samples of door veneer, minimum 24 x 24 inches in size illustrating wood grain, stain color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special installation instructions.
- G. Warranty, executed in Owner's name.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

**107 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

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- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Wood Veneer Faced Doors:
  - 1. Haley Brothers: [www.haleybros.com/#sle](http://www.haleybros.com/#sle).
  - 2. Masonite Architectural; Aspiro Select Wood Veneer Doors: [www.architectural.masonite.com/#sle](http://www.architectural.masonite.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

**202 DOORS**

- A. Doors: See drawings for locations and additional requirements.
  - 1. Quality Level: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS).
  - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
  - 1. Provide solid core doors at each location.
  - 2. Wood veneer facing with factory transparent finish.

**203 DOOR AND PANEL CORES**

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), 5-ply, and faces as indicated.
- B. Fire Rated Doors if shown: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware. Coordinate with submitted hardware package.

**204 DOOR FACINGS**

- A. Wood Veneer Facing for Transparent Finish: Plain sliced Select White birch, veneer grade as specified above for Door Quality Level, book veneer match, center balance assembly match; unless otherwise indicated.
  - 1. Vertical Edges: Any option allowed by quality standard for grade.

**205 DOOR CONSTRUCTION**

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
  - 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

**206 FINISHES - WOOD VENEER DOORS**

- A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified.
  - 1. Transparent Finish: Transparent catalyzed polyurethane, Premium quality, minimal sheen.
  - 2. Stain color shall be selected by Architect from manufacturer's full range.

**207 ACCESSORIES**

- A. Glazing: See Section 08 8000.

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- B. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
  - C. Door Hardware: See Section 08 7100.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

**302 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
  - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

**303 TOLERANCES**

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

**304 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

**305 SCHEDULE**

- A. Refer to Door Schedule on drawings.

**END OF SECTION**



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**SECTION 08 3100  
ACCESS DOORS AND PANELS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Access door and frame units, fire-rated and non-fire-rated, in wall and ceiling locations.
- B. Attic Hatch.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 04 2000: Openings in masonry.
- C. Section 07 9005 - Joint Sealers.
- D. Section 09 2116 - Gypsum Board Assemblies: Openings in gypsum ceilings or partitions.
- E. Section 09 9100 - Painting: Field paint finish.
- F. Divisions 22-26 Sections: Additional access doors provided and installed by Contractors for Plumbing, Mechanical, Electrical and related work.

**103 SUMMARY**

- A. This Section includes access doors for installation in the following types of new construction:
  - 1. Gypsum drywall.
  - 2. Unit masonry.
  - 3. As otherwise indicated.
- B. Provide fire-rated access doors where indicated or scheduled, and at access openings in all walls of stairs, elevator shafts and equipment rooms, other shafts and plumbing chase walls which are partially or fully open through floors, and at walls and ceilings indicated or required by Code to be fire-rated.

**104 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. UL (FRD) - Fire Resistance Directory; Current Edition.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
  - 1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.
- C. Shop Drawings: Indicate exact position of all access door units. Also indicate fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.
- E. Project Record Documents: Record actual locations of each access unit.

**106 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire rated access doors.

1. Provide access doors of fire rating equivalent to the fire rated assembly in which they are to be installed.
  2. Provide products listed and labeled by UL as suitable for the purpose specified and indicated.
- B. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.'s "Building Materials Directory" for rating shown.
1. Provide UL label on each fire-rated access door.
  2. Fire rating label must be accessible, permanent (embossed on metal label), kept legible at all times, and shall contain the fire resistance rating in hours and/or minutes.

#### **107 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- C. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

#### **108 PROJECT CONDITIONS**

- A. Coordinate the work with other work requiring access doors.
- B. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.
- C. Special-Size Access Doors: Use where required or requested; indicate on schedule.

### **PART 2 - PRODUCTS**

#### **201 MANUFACTURERS**

- A. Wall and Ceiling Access Doors:
  1. Acudor Products Inc: [www.acudor.com](http://www.acudor.com).
  2. Bar-Co., Inc.
  3. Cesco Products
  4. J.L. Industries [Basis of Design]: [www.activarcpg.com/jl-industries/](http://www.activarcpg.com/jl-industries/).
  5. Karp Associates, Inc: [www.karpinc.com](http://www.karpinc.com).
  6. Larsens Manufacturing Co.
  7. Milcor by Commercial Products Group of Hart & Cooley, Inc: [www.milcorinc.com](http://www.milcorinc.com).
  8. Nystrom: [www.nystrom.com](http://www.nystrom.com).
  9. The Williams Brothers Corp.
  10. Substitutions: See Section 01 6000 - Product Requirements.

#### **202 ATTIC HATCH**

- A. Nystrom Building Products: [www.nystrom.com](http://www.nystrom.com). Product: NT, Steel Access Door, 36 inch by 36 inch, with 1 inch flange at perimeter, constructed of 14 gauge steel at door, 16 gauge at frame. 1 year warranty. Powder coat. For ceiling mount. Latch: As selected by Architect.
  1. Substitutions: See Section 01 6000 - Product Requirements.
- B. Precision Ladders: [www.precisionladders.com](http://www.precisionladders.com). Product: Super Simplex Disappearing Stairway aluminum folding stairway. Individual tread test weight -1,000 lbs. No shear of rivets when tested at 2,000 lbs. 11 gauge steel frame. 5-3/16" tread depth. Meet ANSI A14.9-2004.
  1. Substitutions: See Section 01 6000 - Product Requirements.

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**203 ACCESS DOORS AND PANELS**

- A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
- B. Units in Fire Rated Assemblies: Fire rating equivalent to the fire rated assembly in which they are to be installed.

**204 MATERIALS AND FABRICATION: ACCESS DOOR UNITS - WALLS AND CEILINGS**

- A. Door and Frame Units: Formed steel.
  - 1. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.
  - 2. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
  - 3. Frames and flanges: 0.058 inch steel.
    - a. Fabricate frame with exposed flange, nominal 1-inch wide around perimeter of frame for units installed in the following construction:
      - 1) Exposed masonry.
      - 2) Exposed concrete.
      - 3) Exposed siding.
    - b. For gypsum drywall or gypsum veneer plaster, furnish perforated flange frames with drywall bead.
    - c. For full-bed plaster and E.I.F.S. applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
  - 4. Door panels: 0.070-inch single thickness steel.
    - a. Painted Flush Panel Doors (non-fire-rated and fire-rated): Fabricate from not less than 16-gage galvanized sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.
      - 1) Restore any damage to galvanized finish with cold-process galvanizing repair paint, prior to applying factory prime coating, or other finishes.
    - b. Stainless Steel Flush Panel Doors: Fabricate from not less than 18-gage stainless steel sheet, with concealed spring hinges or concealed piano hinge set to open 175 degrees. Buff exposed surfaces to #4 satin finish, except where other finishes are indicated.
  - 5. Size: As indicated or as necessary to access and service equipment.
  - 6. Hardware:
    - a. Hardware for Fire-Rated Units: As required for listing.
    - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    - c. Hinge: 175 degree steel piano hinge with removable pin.
    - d. Latch/Lock: Screw driver slot for quarter turn cam latch.
  - 7. Galvanized, hot dipped finish, except where indicated otherwise.
  - 8. Finish: No. 4 finish for stainless units.
- B. Non-Fire Rated Door and Frame Units in Walls:
  - 1. Provide manufacturer's standard flush panel/door and frame.
- C. Fire Rated Door and Frame Units in Walls:
  - 1. For fire rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.
- D. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

**E. Finishes:**

1. Attic hatch: Phosphate dipped with factory applied primer coat.
2. Exterior: 3-coat 70% resin "Kynar 500" finish (i.e.: 7-mil prime coat, 9-mil color coat, and 9-mil clear top coat) with minimum 2.4 mil total dry film thickness, in color to match adjacent finish where occurs, unless otherwise selected by Architect from manufacturer's standard non-metallic colors - 15 colors minimum to select from, including white.
3. Interior, Exposed to Normal View: To match finish on interior. Door "Finish Hardware" (refer to Section 08 7100), or if not indicated, to match existing hardware in room where occurs.
4. Interior, in Service Areas, Above Ceilings, etc: Factory primed baked enamel.
5. Toilet Rooms, Janitors Rooms, Kitchens, Kitchen Areas, Rooms Where Food is Stored, Prepared, Cooked and/or Served, and Break Rooms: Stainless steel, No. 4, satin finish.

**205 FABRICATION**

- A. Weld, fill, and grind joints to ensure flush and square unit.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

**302 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings in relation to adjacent finish surfaces. Secure rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.
- D. Coordinate installation with work of other trades.
- E. Prepare perimeter of rough openings in concrete, CMU, and clay masonry with mortar/grout full-depth of wall and to size required; use pressure-treated wood as necessary for other concealed blocking, grounds, and supports at any stud wall construction.

**303 ADJUST AND CLEAN**

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

**END OF SECTION**

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**SECTION 08 3313  
COILING COUNTER DOORS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Non-fire-rated coiling counter doors and operating hardware.
- B. Fire-rated coiling counter doors and operating hardware.

**102 RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Rough openings.
- B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 09 2116 - Gypsum Board Assemblies: Rough openings.
- D. Section 09 9113 - Exterior Painting: Field paint finish.
- E. Section 09 9123 - Interior Painting: Field paint finish.

**103 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ITS (DIR) - Directory of Listed Products; Current Edition.
- D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
- E. UL (DIR) - Online Certifications Directory; Current Edition.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, 4 inch long, illustrating shape, color and finish texture.
- E. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.
- F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.
- G. Project Record Documents: Include as-built electrical diagrams for electrical operation and connection to fire alarm system.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Coiling Counter Doors:
  - 1. Alpine Overhead Doors, Inc: [www.alpinedoors.com/#sle](http://www.alpinedoors.com/#sle).
  - 2. C.H.I. Overhead Doors: [www.chiohd.com/#sle](http://www.chiohd.com/#sle).
  - 3. Raynor Garage Doors: [www.raynor.com/#sle](http://www.raynor.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

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**202 COILING COUNTER DOORS**

- A. Coiling Counter Doors, Non-Fire-Rated: Powder Coated slat curtain.
  - 1. Mounting: Between jambs, within prepared opening.
  - 2. Nominal Slat Size: 1-1/4 inches wide.
  - 3. Slat Profile: Flat, perforated.
  - 4. Finish, Aluminum: Anodized.
    - a. Factory finish all surfaces that will be exposed in completed assemblies.
    - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
    - c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
  - 5. Finish Color: As selected by Architect from manufacturer's full range of colors (minimum 150 RAL colors).
  - 6. Guides: Formed track; same material and finish unless otherwise indicated.
  - 7. Hood Enclosure: Manufacturer's standard; primed steel.
  - 8. Manual hand chain lift operation.
  - 9. Locking Devices: Slide bolt on inside.
- B. Coiling Counter Doors, Fire-Rated: Powder Coated slat curtain.
  - 1. Mounting: Between jambs, within prepared opening.
  - 2. Provide integral frame and sill of same material and finish.
  - 3. Fire Rating: 3/4 hour; comply with NFPA 80.
    - a. Provide product listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
  - 4. Nominal Slat Size: 1-1/4 inches wide.
  - 5. Slat Profile: Flat.
  - 6. Guides: Formed track; same material and finish unless otherwise indicated.
  - 7. Hood Enclosure: Manufacturer's standard; primed steel.
  - 8. Coiling Door Release Mechanism: Fusible link activated with automatically governed closing speed.
  - 9. Manual hand chain lift operation.
  - 10. Locking Devices: Slide bolt on inside.

**203 MATERIALS**

- A. Curtain Construction: Interlocking, single thickness slats.
  - 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
  - 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
  - 3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 16 gage, 0.06 inch.
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
  - 1. Guides for Galvanized Curtains: ASTM A36/A36M steel angles, size as indicated, hot-dip galvanized per ASTM A123/A123M.
- C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
- D. Lock Hardware:
  - 1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

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- 2. Manual Chain Lift: Provide padlockable chain keeper on guide.
  - E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that opening sizes, tolerances and conditions are acceptable.

**302 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install fire-rated doors in accordance with NFPA 80.
- C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- F. Complete wiring from fire alarm system .

**303 TOLERANCES**

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

**304 ADJUSTING**

- A. Adjust operating assemblies for smooth and noiseless operation.

**305 CLEANING**

- A. Clean installed components.
- B. Remove labels and visible markings.

**END OF SECTION**



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**SECTION 08 3323  
OVERHEAD COILING DOORS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Exterior coiling doors.
- B. Fire-rated coiling doors.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Division 26 Electrical Section: Electrical Power.

**103 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- B. ITS (DIR) - Directory of Listed Products; Current Edition.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment, \_\_\_\_\_.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, 12 inch in size illustrating shape, insulation, color and finish texture.
- E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**105 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

**106 WARRANTY**

- A. Provide manufacturer's standard two-year warranty.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Overhead Coiling Doors:
  - 1. Alpine Overhead Doors, Inc.: [www.alpinedoors.com](http://www.alpinedoors.com).
  - 2. Cornell Iron Works, Inc.: [www.cornelliron.com](http://www.cornelliron.com).
  - 3. Overhead Door Corporation [Basis of Design]: [www.overheaddoor.com](http://www.overheaddoor.com).

4. Wayne-Dalton Corporation: [www.waynedalton.com](http://www.waynedalton.com).
5. Substitutions: See Section 01 6000 - Product Requirements.

**B. Overhead Coiling Fire Doors:**

1. Alpine Overhead Doors, Inc; Fire-Tite Series: [www.alpinedoors.com/#sle](http://www.alpinedoors.com/#sle).
2. Cornell Iron Works, Inc; \_\_\_\_\_: [www.cornelliron.com/#sle](http://www.cornelliron.com/#sle).
3. Overhead Door Corporation; FireKing Model 631 (Basis of Design): [www.overheaddoor.com](http://www.overheaddoor.com).
4. Substitutions: See Section 01 6000 - Product Requirements.

**202 COILING DOORS**

**A. Exterior Coiling Doors: Steel slat curtain, 24 gauge minimum insulated slats, galvanized. Provide Rolling Service Door Series 625, as manufactured by Overhead Door Corporation, or equivalent by one of above named manufacturers.**

1. Capable of withstanding positive and negative wind loads of 20 psf without undue deflection or damage to components.
2. Double skin interlocking metal slats with urethane foamed in place type insulation: insulation (u-) value: 0.15 BTU/hr sq ft deg F or better.
3. Nominal Slat Size: 2 inches wide by required length.
4. Powder coat finish: Minimum 197 standard colors (to be selected by Architect after bidding).
5. Guides: Structural Steel Angles; galvanized steel.
6. Windlocks and Endlocks.
7. Hood Enclosure: Manufacturer's standard; primed steel.
8. Torsion springs counterbalance mechanism.
9. Weatherseals: Bottom, exterior guide, interior hood, and interior guide.
10. Bottom bar: Galvanized steel, with bottom weather seal.
11. Electric operation: Complete with heavy duty electrically powered door operator and all standard accessories
12. Mounting: Within framed opening.
13. Interior latch only.
14. Lock: Locking bar; prepared to receive padlock supplied by others.

**B. Coiling Security Grille: Horizontal acting. Non fire-rated.**

1. Curtain: Galvanized steel links and rods with mill aluminum spacer tube.
2. Curtain Pattern: Straight lattice 9" center vertical links with 2" center rod spacing.
3. Door Roll: Directly driven, springless steel tube roll with integral shafts, keyed on the drive end and supported by self-aligning grease-able sealed bearings.
4. Hood: 24 gauge black painted steel.
5. Guides: Three structural steel angles with powder coat finish.
6. Bottom Bar: Tubular extruded aluminum with mill finish.
7. Warranty: 24 month on door components.
8. Model: Overhead Door Series No. 681.

**C. Fire-Rated Coiling Doors: Steel slat curtain; comply with NFPA 80.**

1. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for purpose specified and indicated on drawings.
2. Oversized Openings: Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated units and operating hardware assembly.
3. Single Thickness Slats: Manufacturer's standard.
4. Finish: Galvanized, powder coated, in color selected from manufacturer's full range of colors.
5. Guides, Angles: weathered finish; powder coat.

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6. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03" per foot of span. Counterbalance adjustable by means of adjusting tension wheel.
  7. Brackets: To support counterbalance, curtain and hood.
    - a. Hot rolled steel with black powder coated finish.
  8. Hood Enclosure: Manufacturer's standard; 24 gauge galvanized steel. Provide intermediate support for opening over 13'-6".
  9. Coiling Door Release Mechanism: Fire alarm system activated with automatically governed closing speed.
  10. Mechanical auto resettable hoist (non-motorized).
  11. Fusible link: Automatically closes door in case of fire.
  12. Manual push up operation.
  13. Mounting: As indicated.
  14. Warranty: 24 month on door.
  15. Locking Devices: Lock and latch handle on outside.

**203 MATERIALS AND COMPONENTS**

- A. Metal Curtain Construction: Interlocking slats.
  1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
  2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum 24 gauge ASTM A 653/A 653M galvanized steel sheet (for exterior and interior sheets), unless recommended to be thicker by manufacturer.
  1. Superior performance powder coat finish, in color as selected by Architect.
- C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
  1. Minimum thickness; 24 gage, 0.0239 inch.
  2. Superior performance powder coat finish, in color as selected by Architect.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that adjacent construction is suitable for door installation.
- B. Verify that electrical services have been installed and are accessible.
- C. Verify that door opening is plumb, header is level, and dimensions are correct.
- D. Notify Architect of any unacceptable conditions or varying dimensions.
- E. Commencement of installation indicates acceptance of substrate and door opening conditions.

**302 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install fire-rated doors in accordance with NFPA 80.
- C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

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- E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
  - F. Coordinate installation of electrical service with Division 26 Section.
  - G. Complete wiring from fire alarm system.
  - H. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 9005.
  - I. Install enclosure and perimeter trim.

**303 TOLERANCES**

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

**304 ADJUSTING**

- A. Adjust operating assemblies for smooth and noiseless operation.

**305 CLEANING**

- A. Clean installed components.
- B. Remove labels and visible markings.

**END OF SECTION**

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**SECTION 08 3490  
TORNADO-RESISTANT ASSEMBLIES**

**PART 1 – GENERAL**

**101 RELATED DOCUMENTS:**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**102 SUMMARY:**

- A. Section includes:
  - 1. Hollow metal Tornado Doors
  - 2. Hollow metal Tornado Frames
- B. Exclusions: Metal for the following is not provided under the scope of this section:
  - 1. Structural steel
  - 2. Headers and lintels
  - 3. Framing
  - 4. Steel channel frames
  - 5. Access panels
  - 6. Door hardware
- C. Related Sections:
  - 1. Division 03 Section “Precast Structural Concrete”
  - 2. Division 04 Section “Unit Masonry”
  - 3. Division 07 Section “Joint Sealants”
  - 4. Division 08 Section “Steel Doors and Frames”
  - 5. Division 08 Section “Door Hardware”
  - 6. Division 08 Section “Glass and Glazing”
  - 7. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
  - 8. Division 28 Sections for coordination with other components of other components of electronic access control system.

**103 REFERENCES:**

- A. Tornado Resistant Assemblies
  - 1. IBC – International Building Code
    - a. 2021 Edition, Section 423 – Building types or functions and geographic locations to be built with a storm shelter
  - 2. ICC/NSSA - International Code Council / National Storm Shelter Association
    - a. ICC 500-2020 Standard for the Design and Construction of Storm Shelters
    - b. Highlights of ICC 500-2020
  - 3. FEMA – Federal Emergency Management Agency
    - a. FEMA P-361, Third Edition / March 2015 – Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms
    - b. FEMA P-320, December 2014 – Taking Shelter from the Storm: Building a Safe Room for Your Home or Small Business
- B. Fire/Life Safety
  - 1. NFPA - National Fire Protection Association
    - a. NFPA 70 – National Electric Code
    - b. NFPA 80 - Standard for Fire Doors and Fire Windows
    - c. NFPA 101 - Life Safety Code

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- d. NFPA 105 - Smoke and Draft Control Door Assemblies
  - 2. State Fire Safety Code.
  - C. UL - Underwriters Laboratories
    - 1. UL 10C - Positive Pressure Test of Fire Door Assemblies
    - 2. UL 1784 - Air Leakage Tests of Door Assemblies
  - D. Accessibility
    - 1. ADA - Americans with Disabilities Act.
    - 2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - E. SDI – Steel Door Institute
    - 1. SDI 100/ANSI A250.8 - Recommended Specifications - Standard Steel Doors and Frames.
    - 2. SDI Certified <https://www.steeldoor.org/sdicertified.php>
    - 3. SDI 105 - Recommended Erection Instructions for Steel frames.
    - 4. SDI 111 - Recommended Details and Guidelines for Standard Steel Doors and Frames and Accessories.
    - 5. SDI 112 - Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames.
    - 6. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
    - 7. SDI 118 - Basic Fire Door Requirements.
    - 8. SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
    - 9. SDI 124 - Maintenance of Standard Steel Doors and Frames.
  - F. ANSI - American National Standards Institute (refers to most current versions of standards)
    - 1. ANSI/DHI A115.IG - Installation Guide for Doors and Hardware.
    - 2. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties
    - 3. ANSI A250.3 - Test Procedure and Acceptance Criteria for - Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
    - 4. ANSI A250.4 - Test Procedure and Acceptance Criteria for - Physical Endurance for Steel Doors, Frames, Frame Anchors, and Hardware Reinforcings. Product is tested and provided as Level “A”, 1,000,000 cycle test criteria and other requirements as listed in these specifications.
    - 5. ANSI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
    - 6. ANSI/SDI A250.8/SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
    - 7. ANSI A250.10 - Test Procedures and Acceptance Criteria for – Prime Painted Steel Surfaces for Steel Doors and Frames.
    - 8. ANSI A250.11 - Recommended Erection Instructions for Steel Frames.
  - G. NAAMM - National Association of Architectural Metal Manufacturers
    - 1. NAAMM/HMMA-840 - Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

**1.04 SUBMITTALS:**

- A. General:
  - 1. Submit the following in accordance with conditions of contract and Division 01 requirements.
  - 2. Advise Architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.
  - 3. Prior to forwarding submittal: Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
- B. Action Submittals:
  - 1. Product Data: Provide illustrations from manufacturer’s catalogs and data in brochure form for all products, including model, function, reinforcements, anchoring, design, finish, and options.

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2. Door and Hardware Schedule: Organize schedule into spreadsheet format indicating complete designations of every item required for each door and frame. Door and hardware schedule shall clearly indicate architect's door number, elevations, and notes.
  3. Shop Drawings: Drawings of openings aligning with the Door, frame, and hardware schedule in accordance with SDI 111D. Show types, quantities, dimensions, specified performance, design criteria, materials and similar data for each opening required.
    - a. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive specified hardware.
    - b. Indicate all door elevations, internal reinforcements and closure methods.
    - c. Indicate all hardware and accessories.
  4. Templates: After final approval of the door and hardware schedule, provide listing of manufacturer's hardware locations for each item of hardware.
- C. Informational Submittals:
1. Qualification Data: For manufacturer, supplier, installer and Certified Door Consultant.
    - a. Supplier: A direct account of the manufacturer who has on permanent staff, an Architectural Hardware Consultant (AHC), a Certified Door Consultant (CDC) or an Architectural Openings Consultant (AOC), who will be available to consult with the Architect and Contractor regarding matters affecting the door and frame openings.
  2. Product Certificates and Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by the manufacturer and witnessed by a qualified, accredited testing agency for doors and frames located in accessible routes.
    - a. Evidence of manufacturer as "SDI Certified" from the Steel Door Institute.
    - b. Manufacturer evidence of compliance with standards shown in 1.03 "References" section of this document.
    - c. Listing Report number from an accredited testing and labeling facility (Intertek / UL) for the AHJ's reference to the tornado approval. Listing Report shall communicate design wind pressure and missile impact tests in accordance with FEMA 361 / ICC 500-2020 requirements
    - d. Report with calculations of anchoring requirements including locations and minimum required capacity from a third-party PE based on accepted engineering practice shall be made available upon request.
    - e. Certificate or signed letter stating 5 years minimum experience installing labeled tornado products
    - f. Certificates of compliance and installation instructions shall be made available upon request of Architect or authority having jurisdiction.
  3. Warranty: As specified in this section pertaining to manufacturer, supplier and installer.
- D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include the following:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Copy of final approved door and frame schedule, edited to reflect conditions as-installed.
    - e. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

**105 QUALITY ASSURANCE:**

- A. Product Substitutions: For the purpose of performing the work of this section, comply with product requirements stated in Division 01 and as specified herein.



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1. Where a specific manufacturer's product is named and accompanied by the words "No Substitute," including make or model number or other designation, provide the product exactly as specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
    - a. Where no additional products or manufacturers are listed in a product category, requirements for "No Substitute" govern product selection.
  2. Where products indicate "acceptable substitute" or "acceptable manufacturer", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
  3. Substitutions: Refer to Division 01 for additional information regarding substitutions and submittals.
- B. Supplier Qualifications and Responsibilities: A direct account of the manufacturer. A recognized hollow metal door and frame supplier of tornado-resistant approved systems, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying hollow metal doors and frames similar in quantity, type, and quality to that indicated for this project.
1. Engineering Responsibility: Preparation of data for field spliced or field modified units, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.
  2. Coordination Responsibility: Coordinate preparation of the door hardware and provide installation and technical data to the Architect and other related subcontractors.
    - a. Upon completion of hollow metal door and frame installation, inspect and verify that all components are working properly.
- C. Manufacturer: Member of Steel Door Institute and is SDI Certified, with specialized capabilities manufacturing tornado-resistant opening systems complying with ICC 500-2020 and FEMA 361, and provides labeled doors and frames from a qualified, accredited testing agency, including hardware and accessories as specified in this section with minimum five years documented experience manufacturing tornado labeled systems.
1. Manufacturer Installation Instructions: Contractor shall maintain a current copy of tornado shelter storm door, frame and hardware manufacturer published installation instructions and FEMA 361/ICC 500-2020 requirements in Project Field Office and refer to installation instructions at all times during installation.
  2. Tornado-Resistant Openings Systems: Provide complete door systems for tornado-resistant storm shelters and other areas of refuge complying and tested according to FEMA 361, Second Edition (2008), Design and Construction Guidance for Community Safe Rooms; and ICC 500 (2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
  3. Label tornado-resistant doors and frames with permanently affixed metal labels (non-Mylar) to clearly denote compliance with FEMA 361 and ICC 500-2020.
    - a. Each door and frame will have its own permanent label showing what criteria the door and frame was tested in accordance with. The label will show what independent laboratory tested this assembly. The label will show test pressures both positive and negative in pounds per square foot and the design pressure both positive and negative.
    - b. Doors with glass shall be etched or similarly labeled.
- D. Installer Qualifications: Qualified tradesmen, skilled in the application of tornado hollow metal doors and frames that has a record of successful in-service performance for installing hollow metal doors and frames similar in quantity, type, and quality to that indicated for this project.
- E. Single Source Responsibility: Obtain each type of hollow metal door and frame from a single manufacturer.

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- F. Fire-Rated Openings: Provide doors and frames for fire-rated openings that complies with NFPA Standard No. 80, UL10C, Category “A”, Positive Pressure Test of Fire Door Assemblies, and requirements of authorities having jurisdiction. Provide only doors and frames that are labeled and listed for ratings indicated by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authority having jurisdiction.
    - 1. Affix a physical label or approved marking to each fire door or fire door frame, at an authorized facility as evidence of compliance with procedures of the labeling agency. Label embossment is not permitted.
    - 2. Conform to applicable codes for fire ratings. It is the intent of this specification that hardware and its application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.
    - 3. Fire door assemblies in exit enclosures and exit passageways; maximum transmitted temperature end point rating of not more than 250 degrees F (121 degrees C) above ambient at the end of 30 minutes of the standard fire test exposure.
  - G. Refer to Division 01 Section “Special Conditions” for additional information and minimum experience requirements.

**106 DELIVERY, STORAGE, AND HANDLING:**

- A. Tag each item or package separately with identification related to the final door and frame schedule, and include installation instructions with each delivery.
- B. Comply with manufacturer’s current written instructions and recommendations.
- C. Deliver doors in manufacturer’s standard labeled protective packaging.
- D. Accept products on site in manufacturer’s packaging. Inspect for damage. Return damaged Products and replace with undamaged products.
- E. Project field superintendent shall inspect products immediately upon delivery to project site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project field superintendent shall direct that non-complying products be removed from project site immediately.
- F. Handle, store and protect products in accordance with the manufacturers printed instructions and ANSI/SDI A250.10 and NAAMM/HMMA 840.
- G. Project Conditions:
  - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- H. Protection and Damage:
  - 1. Promptly replace products damaged during shipping with exactly the same products.
  - 2. Handle doors and frames in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during the course of the Work.
  - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- I. Refer to Division 01 Sections “Summary of Work” and “Special Conditions” for additional information and requirements regarding stored materials.

**107 COORDINATION:**

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. See Division 03 for concrete, reinforcement, and formwork requirements, and Division 04 2000 “Unit Masonry”.

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- B. Coordinate work with frame opening construction, door and hardware installation. Coordinate work with Section 08 11 00 Steel Doors and Frames, Section 08 71 00 Finish Hardware, and other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
  - C. Verify field dimensions for factory assembled frames prior to fabrication.
  - D. Installation: Sequence installation to accommodate required door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing doors and frames to comply with indicated requirements.
  - E. Electrical System Roughing-In: Coordinate layout and installation of doors and frames with electrified door hardware connections.

**108 WARRANTY:**

- A. Provide manufacturer's warranties as specified in Division 01 and as follows:
  - 1. Hollow Metal Doors and Frames: 1 year.
  - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use, or abuse.

**109 MAINTENANCE:**

- A. Maintenance Instructions: Furnish a complete set of maintenance instructions as needed for Owner's continued maintenance of doors and frames.

**PART 2 – PRODUCTS:**

**201 MANUFACTURERS:**

- A. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- B. Acceptable Manufacturer: Steelcraft, Paladin Series PW doors and FP frames.

**202 MATERIALS:**

- A. Fasteners
  - 1. Provide fastenings, anchors and clips as required to secure hollow metal work in place. Provide and install manufacturers standard screws. Dimple metal work to receive screw heads. Set stops and other non-structural fastenings with manufacturer’s standard self-tapping screws.

**203 STEEL FRAMES – PALADIN FP14 SERIES FRAMES:**

- A. Manufacturer:
  - 1. Scheduled Manufacturer: Steelcraft.
  - 2. Acceptable Substitute: Republic, AMBICO
- B. Provide 14 Gauge A60 galvanized steel.
- C. Provide tornado-resistant hollow metal frames as scheduled, and drawn and detailed on plans, with the provisions below.
- D. Provided die-mitered corner connections to ensure tight/closed miters at head and jambs.
- E. Factory prep: Welded.
- F. Provide patented universal hinge preparations.
- G. Provide beveled hinge and strike edges.
- H. Provide 7 gauge hinge reinforcement. Provide 14 gauge full length reinforcement for continuous hinges.

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- I. Provide 12 gauge steel center strike reinforcement with 14 gauge head/sill strike reinforcement.
  - J. Provide adjustable base anchors to allow for adjustment in installation when the floor is not level.
  - K. Provide factory applied baked-on rust-inhibiting primer.
  - L. When supported by the proper signed, third party PE reports calculating approved anchoring, provide frames anchored with or without grout fill. When using 4" face, provide frames grouted full utilizing proper grout fill protocols per SDI/ANSI 250.8.
  - M. Provide 14 gauge steel closer reinforcements when specified.
  - N. Opening sizes: Shall not exceed the smallest and largest sizes tested and approved per ICC 500-2020. Available sizes shall be publicly available on Intertek or UL listing websites.
  - O. Fire Rating: Where called for by the door and hardware schedules, tornado-resistant doors, frames, shutter, and glass lights shall be identified by an official metal label or etching (for glass) to signify tested approval from ITS – Warnock Hersey or Underwriters' Laboratories, to UL 10C protocols.

**204 STEEL FRAMES – ANCHORING:**

- A. Provide hollow metal frames as scheduled, and drawn and detailed on plans, with the provisions below.
- B. Approved frame anchors and any necessary anchor bolts certified by third party PE reports shall be provided from the factory for concrete walls (tilt-up/pre-fab/poured in place) or concrete-filled CMU block walls.
- C. Provide installation instructions.
- D. Provide anchoring approved by UL or Intertek Testing Services / Warnock Hershey (ITS/WHI), supported by testing and third-party PE reports.
- E. Grout new masonry frames full.
- F. Provide frames to be used in existing masonry with tube and strap anchors welded from the factory.

**205 STEEL DOORS – PALADIN PW14 SERIES DOORS:**

- A. Provide tornado-resistant hollow metal doors as scheduled, and drawn and detailed on plans, with the provisions below.
- B. Provide standard 14 gauge, A-60 galvanized steel face skins for resistance against corrosion.
- C. Steel stiffened core construction: Provide stiffeners welded to one face sheet and bonded to the opposite face sheet
- D. Seamless, full height, mechanical interlock edges: Provide lock and hinge edges intermittently welded and filled smooth for structural support and stability the full height of the door.
- E. Provide full height lock side continuous 12 gauge steel reinforcement channels at lock rails.
- F. Provide 12 gauge top channel and 14 gauge bottom channel steel reinforcement.
- G. Provide doors with beveled hinge and lock edges.
- H. Provide universal hinge preparations.
- I. Provide 7 gauge hinge reinforcements.
- J. Provide 14 gauge closer reinforcements.
- K. Provide factory applied baked-on rust-inhibiting primer in accordance with ANSI A250-10, with finish paint options available.
- L. Provide 1-3/4 inch thick doors.

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- M. Opening sizes shall not exceed the smallest and largest sizes tested and approved per ICC 500-2014. Available sizes shall be publically available on Intertek or UL listing websites.
  - N. Provide handed doors and frames.
  - O. Provide doors beveled both hinge and lock sides.
  - P. Custom door undercuts shall be made available, provided they meet with the labelling agencies requirements.
  - Q. Follow installation instructions provided by the manufacturer. The hardware manufacturer's strike must be used. Anchor or grout bottom strikes into the foundation slab.

**206 FINISHES:**

- A. Chemical Treatment: Treat steel surfaces to promote proper paint adhesion per ANSI/SDI A250.3, Test Procedure and Acceptance Criteria for Factory Applied Finished Painted Steel Surfaces for Steel Doors and Frames.
- B. Factory Prime Finish: Meet requirements of ANSI A 250.10., Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

**207 TORNADO-RESISTANT DOOR HARDWARE AND ACCESSORIES:**

- A. Provide approved hardware and accessories under Section 08 71 00 as part of the complete prescriptive door assembly opening by Intertek or UL public listing for the labeled tornado-resistant assembly, communicating compliance with FEMA 361 guidelines and ICC 500-2020 standards.

**208 FABRICATION:**

- A. Fabricate doors and frames in accordance with requirements of ANSI A250.8-2003/SDI 100.
- B. Fabricate fire rated doors and frames in accordance with requirements of ITS – Warnock Hersey or Underwriters' Laboratories, with metal label on each door and frame signifying UL-10C compliance.
- C. Typical Frame Reinforcing: Provide steel reinforcement as required for hardware items per manufacturers templates. Provide reinforcing per ANSI-A250.6.
- D. Mortar Guards in Frames: For hinge and strike plate cutouts, provide fully enclosed pressed steel cover boxes spot welded to frames behind mortises. Additionally, for frames in masonry walls and frames being grout filled, provide metal mortar guards for any mortised cutouts.
- E. Hardware Preparation at Frames: Mortise, reinforce, drill and tap as required for all mortised hardware furnished under Division 8 Finish Hardware and/or Division 26 Security in accordance with a final approved hardware schedule and templates provided by the hardware supplier and/or security supplier (including electric hinges and/or power transfers, door position switches, and other electrified hardware). Drilling and tapping for surface door closers, door closer brackets, and adjusters shall be done in field by hardware installer. Obtain templates from hardware and security suppliers. Provide hardware preparation per ANSI-A250.6.
- F. Joining at Frames:
  - 1. At welded frames with equal width jambs and head, neatly miter on face and cope and butt stops. At other welded frames, provide same mitered joint wherever possible (at intersection of jamb-head or jamb-sill) and at other locations butt metal neat. Full profile weld as specified. Fabricate so no grind marks, hollow or other out-of-plane areas are visible. At joints of intermediate members (such as mullions), provide tight joining, neatly accomplished without holes, burned out spots, weld build up or other defacing work. Fill to close cracks and to preserve shapes. Tightly fit loose stops, to hairline joints. Joints shall be finished and primed.
- G. Typical Door Reinforcement: Provide galvanized steel reinforcement as required for hardware items per manufacturers' templates. Provide reinforcing per ANSI-A250.6.

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- H. Hardware Preparation at Doors: Mortise, reinforce, drill and tap as required for all mortised hardware furnished under Division 08 Finish Hardware and/or Division 28 Access Control in accordance with a final approved hardware schedule and templates provided by the hardware supplier and/or security supplier (including a minimum 1/2 inch raceway for electrical hardware, electric hinges and/or power transfers, door position switches, and other electrified hardware). Obtain templates from hardware and security suppliers. Provide hardware preparation per ANSI-A250.6.

**PART 3 – EXECUTION**

**301 EXAMINATION:**

- A. Prior to installation of any doors and frames, examine supporting structure and conditions under which hollow metal doors and frames are to be installed. Correct all defects prior to proceeding with installation.
- B. Correct unacceptable conditions are or defer to the architect or responsible building contractor to fix unacceptable conditions prior to hollow metal installation or at any point where unacceptable conditions are discovered.

**302 PREPARATION:**

- A. Where on-site modification of doors and frames is required, prepare hardware locations in accordance with the following:
1. Tornado assemblies shall not be unduly modified. Consult with the manufacturer or the Authority Having Jurisdiction as needed to maintain the labeled approval of the tornado door system, complying with ICC 500-2020.
  2. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
  3. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.

**303 INSTALLATION:**

- A. Install hollow metal in accordance with reviewed shop drawings and manufacturer's printed instructions. Securely fasten and anchor work in place without twists, warps, bulges or other unsatisfactory or defacing workmanship. Set hollow metal plumb, level, square to proper elevations, true to line and eye. Set clips and other anchors with Ramset "shot" anchors or drill in anchors as approved. Units and trim shall be fastened tightly together, with neat, uniform and tight joints.
- B. Placing Frames: Remove manufacturer's shipping spreader-bars prior to installation. These shall not be used for setting of proper frame tolerances. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set in accordance with ANSI A250.11. After wall construction is complete, remove temporary braces and/or installation spreaders leaving surfaces smooth and undamaged. In masonry construction, building-in of anchors and grouting of frames with mortar is specified in Division 04 Section - Unit Masonry. At in-place concrete or masonry construction, set frames and secure in place using countersunk bolts and expansion shields, with bolt heads neatly filled with metallic putty, ground smooth and primed.
- C. Place fire-rated frames in accordance with NFPA 80, and/or manufacturer's follow-up procedure requirements.
- D. Consult Hollow Metal technical data and installation instruction. The hardware manufacturer's installation instructions must be followed to maintain tornado-resistant assembly approval.
- E. Where continuous hinges are specified, provide full height 3/8 inch (9.5 mm) to 1-1/2 inch (38 mm) thick strip of polystyrene foam blocking at frames requiring grouting. Apply the strip to the back of the frame, where the hinge is to be installed, to facilitate field drilling or tapping.

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- F. Doors with internal concealed rods and associated latches shall be installed at the factory by the door manufacturer prior to shipment to the job site. Base installation upon FEMA lock manufacturer's template and install instructions. Field installation, or supplier shop installation, of FEMA concealed internal rods and rod latches will not be accepted.
  - G. Door Installation: Fit hollow metal doors accurately in their respective frames, within following clearances: Jambs and head 1/8 inch, meeting edges pair of doors 1/8 inch, sill where no threshold or carpet 1/4 inch above finished floor, sill at threshold 3/4 inch maximum above finished floor, sill at carpet 1/4 inch above carpet. Place fire-rated doors with clearances as specified in NFPA 80.
  - H. Apply hardware in accordance with hardware manufacturers' instructions and Section 08 71 00 of these specifications. Install hardware with only factory-provided fasteners. Install silencers. Adjust door installation to provide uniform clearance at head and jambs, to achieve maximum operational effectiveness and appearance.
  - I. Drill and tap for surface door closers, door closer brackets, and other surface applied hardware.

**3.04 FIELD QUALITY CONTROL:**

- A. After installation of frames has been completed, a qualified person from the hardware installation company is to check the project to confirm the proper installation of frames to allow for the proper installation of doors and finish hardware scheduled.
- B. Installer shall deliver to owner, upon completion, one set of installation and maintenance instructions for doors and frames.
- C. Regular field inspection and adjustment is accepted and recommended to ensure proper latching throughout the life of the product.

**3.05 ADJUSTING:**

- A. Final Adjustments: Adjust doors and hardware prior to final inspection and acceptance by the Architect and Owner. Replace defective items including doors or frames that are damaged or unacceptable to the Architect and Owner. Regular field inspection and adjustment is accepted and recommended to ensure proper latching throughout the life of the product.
  - 1. Adjust doors for proper operation, free from binding or other defects.
  - 2. Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.
  - 3. Prime Coat / Touch up immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible, approved air-drying primer
- B. Fire Door Assembly Inspection and Testing: Upon completion of the installation, provide functional testing and inspection of each fire door assembly on the project to confirm proper operation and that it meets all criteria of a fire door assembly as per NFPA 80. Inspections shall be performed by individuals who are certified by Intertek as a Fire Door Assembly Inspector (FDAI) or a credentialed Architectural Hardware Consultant (AHC). A written report using reporting forms provided by the Door and Hardware Institute shall be maintained and transmitted to the Owner and made available to the authority having jurisdiction (AHJ). The report shall list each fire door throughout the project, and include each door number, location, hardware set used and summary of deficiencies.
  - 1. Schedule fire door assembly inspection within 90 days of substantial completion of the project.
  - 2. Correct all deficiencies and schedule a re-inspection of fire door assemblies which were noted as deficient on the inspection report.
  - 3. Inspector shall re-inspect fire door assemblies after repairs are made.
  - 4. Additional re-inspections which are required due to incomplete repairs will be performed by the inspector at the expense of the Contractor.
  - 5. Prime Coat Touch-Up: Immediately after installation, sand smooth rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

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**306 PROTECTION:**

- A. Provide for the proper protection of doors and frames until the Owner accepts the project as complete. Damaged or disfigured doors and frames shall be replaced or repaired by the responsible party. Some repairs may not be allowed in the field in order to maintain the labeled tornado approval. Consult with the manufacturer or the Authority Having Jurisdiction.
- B. Advise General Contractor on measures necessary to protect installed products and finished surfaces from damage during construction.

**END OF SECTION**



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**SECTION 08 4313  
ALUMINUM-FRAMED STOREFRONTS**

**PART 1 - GENERAL**

**401 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Perimeter sealant.

**402 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 05 5000 - Metal Fabrications: Steel attachment devices.
- C. Section 07 8400 - Firestopping: Firestop at system junction with structure.
- D. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.
- E. Section 08 4413 - Glazed Aluminum Curtain Walls.
- F. Section 08 5113 - Aluminum Windows: Fixed aluminum windows.
- G. Section 08 7100 - Door Hardware: All door hardware, except weatherstripping.
- H. Section 08 8000 - Glazing: Glass and glazing accessories.

**403 REFERENCE STANDARDS**

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- I. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

**404 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

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**405 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Samples: Submit two samples 12 by 12 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- G. Submit all storefront materials and accessory products to glazing manufacturer to verify materials compatibility with glazing.
- H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

**406 QUALITY ASSURANCE**

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

**407 DELIVERY, STORAGE, AND HANDLING**

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

**408 FIELD CONDITIONS**

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

**409 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Warranty shall include language relating to watertightness and air tightness.
- E. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
- F. Glazing Warranty: 10 years from date of Substantial Completion.

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**PART 2 - PRODUCTS**

**501 MANUFACTURERS**

- A. Manufacturers:
1. Kawneer North America; Product Trifab Versaglaze 451 [Basis of Design]: [www.kawneer.com](http://www.kawneer.com).
  2. Oldcastle BuildingEnvelope: [www.oldcastlebe.com](http://www.oldcastlebe.com).
  3. Tubelite, Inc.: [www.tubeliteinc.com](http://www.tubeliteinc.com).
  4. YKK AP America, Inc. : [www.ykkap.com](http://www.ykkap.com).

**502 ALUMINUM-FRAMED STOREFRONT**

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Include structural reinforcing in mullions as required.
  2. Include solid back frame closure at end of storefront runs, sides and top of storefront.
  3. Glazing Rabbet: For 1 inch insulating glazing for exterior applications. As indicated for interior applications.
  4. Glazing Position:
    - a. Interior: Inside glazed, center plane, unless indicated otherwise.
  5. Provide miscellaneous framing as indicated on drawings.
  6. Water Leakage Test Pressure Differential: 12 lbf/sq ft.
  7. Air Infiltration Test Pressure Differential: 6.24 psf.
  8. Finish: Class I color anodized.
    - a. Factory finish all surfaces that will be exposed in completed assemblies.
    - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
  9. Finish Color: Black Anodized
  10. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
  11. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
  12. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
  13. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
  14. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
  15. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

**503 PERFORMANCE REQUIREMENTS**

- A. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
1. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

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- B. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code FLA (PAD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
  - C. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
  - D. Water Leakage: None, when measured in accordance with ASTM E331 at specified pressure differential.

**504 COMPONENTS**

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
  - 1. Framing members for interior applications need not be thermally broken.
  - 2. Glazing Stops: Flush.
  - 3. Cross-Section: 2 x 6 inch nominal dimension for interior applications, unless noted otherwise.
- B. Glazing: See Section 08 8000.
- C. Swing Doors: Flush aluminum. Heavy Duty for exterior doors.
  - 1. Thickness: 1-3/4 inches.
  - 2. Top Rail: 5 inches wide, nominal.
  - 3. Middle Rail: 8 inches wide, nominal.
  - 4. Vertical Stiles: 5 inches wide, minimum.
  - 5. Bottom Rail: 10 inches wide, minimum.
  - 6. Glazing: Double glazed.
  - 7. Finish: Black Anodized
- D. Provide filler panel to close back of frame.
- E. Sub-Sill: At all sill locations (whether or not indicated on the Drawings) provide matching extruded aluminum sub-sill with end dams.

**505 PERFORMANCE REQUIREMENTS**

- A. Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
  - 1. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at specified differential pressure across assembly in accordance with ASTM E 283.
- D. Water Leakage: None, when measured in accordance with ASTM E 331 at specified pressure differential.
- E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- F. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

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**506 MATERIALS**

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Fasteners: Stainless steel.
- D. Perimeter Sealant: Type specified in Section 07 9005.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- F. Glazing Accessories: See Section 08 8000.

**507 FINISHES**

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.
- B. Color:
  - 1. Exterior: Black Anodized
  - 2. Interior: Black Anodized
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

**508 HARDWARE**

- A. For each door, include weatherstripping.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

**509 FABRICATION**

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- E. Arrange fasteners and attachments to conceal from view.
- F. Reinforce components internally for door hardware and door operators.
- G. Increase gauge or reinforce framing members as required for imposed loads and span conditions.
- H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
  - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
- I. Fit and seal primary frame joints prior to installing filler panel.

**PART 3 - EXECUTION**

**601 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

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**602 INSTALLATION**

- A. Install wall system in accordance with manufacturer's instructions, and with AAMA - Metal Curtain Wall, Window, Storefront and Entrance - Guide Specifications Manual.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 8000.
- K. Install perimeter sealant in accordance with Section 07 9005.
- L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

**603 TOLERANCES**

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

**604 ADJUSTING**

- A. Adjust operating hardware for smooth operation.

**605 CLEANING**

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

**606 PROTECTION**

- A. Protect installed products from damage until Date of Substantial Completion.

**END OF SECTION**

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**SECTION 08 8000  
GLAZING**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Glass.
- B. Glazing compounds and accessories.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 08 1416 - Flush Wood Doors: Glazed doors. Glazing furnished by door manufacturer.
- C. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.
- D. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing furnished by wall manufacturer.
- E. Section 08 5113 - Aluminum Windows: Glazing furnished by window manufacturer.
- F. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Framed Mirrors.

**103 REFERENCE STANDARDS**

- A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- G. ASTM C1376 - Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.
- H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- J. GANA (GM) - GANA Glazing Manual; 2022.
- K. GANA (SM) - GANA Sealant Manual; 2008.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Provide compatibility testing of IGU edge seal with glazing compounds and setting blocks, and submit results of testing.



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- E. Product Data on Decorative Privacy Glazing Film for specified product.
  - F. Samples:
    - 1. Submit two samples 12x12 inch in size of glass units, showing coloration and design, for selection purposes.
    - 2. Submit 2 samples, minimum of 5" Wide x 60" Long of Decorative Privacy Glass Film, showing entire width of pattern, texture, and opacity level.
  - G. Shop Drawing showing plan & elevation of doors to receive film with installation orientation and dimensions.
  - H. Manufacturer's requirements for product delivery, handling, site conditions, and installation recommendations for Decorative Privacy Glazing Film.
  - I. Manufacturer's operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods for Decorative Privacy Glazing Film.
  - J. Certificates: Certify that products meet or exceed specified requirements.
  - K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    - 1. See Section 01 6000 - Product Requirements, for additional provisions.
    - 2. Extra Glazing Film Materials: Furnish 2 percent extra material at the time of installation for future maintenance repairs. Deliver in protective packaging for storage, and label contents appropriately. Contractor shall store as recommended by manufacturer and deliver to Owner's Representative at Substantial Completion.

**106 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.
- B. Labeling: Furnish each pane of fire resistance-rated glazing and each pane of safety glazing with a permanent identification which meets the requirements of the latest approved edition of the International Building Code.
- C. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual", and SIGMA TM-3000, "Vertical Glazing Guidelines", except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- D. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
- E. Fire Resistance Rated Glass: Provide glass products that meet CPSC 16 CFR 1201, Category II requirements for fire-rated glass and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of the inspecting and testing organization indicated below.
  - 1. Insulating Glass Certification Council (IGCC).
    - a. ASTM E 2190.
- G. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- H. Installer of Decorative Privacy Glazing Film shall be performed by a trained and qualified installer, specialized and experienced with installation of window film. Provide documentation that installer has

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installed window film on at least 3 previous projects.

**107 FIELD CONDITIONS**

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

**108 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
- C. Replacements Under Warranties: Provide same warranty as original glass and glazing, beginning from date of replacement completion for glass units replaced under Warranty provisions.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Basis of Design: Vitro Architectural Glass (Formerly PPG); [www.vitroglazings.com](http://www.vitroglazings.com).
- B. Other Acceptable Manufacturers:
- C. TGP America; [www.tgpamerica.com](http://www.tgpamerica.com).
- D. Viracon; [www.viracon.com](http://www.viracon.com).
- E. Guardian Industries Corp: [www.sunguardglass.com](http://www.sunguardglass.com).
- F. Pilkington North America Inc: [www.pilkington.com/na](http://www.pilkington.com/na).
- G. AGC Glass Company; [www.agc.com](http://www.agc.com).
  - 1. Bendheim Architectural Glass; [www.bendheim.com](http://www.bendheim.com).
  - 2. Oldcastle Glass; [www.oldcastleglass.com](http://www.oldcastleglass.com).
  - 3. Cardinal Glass Industries; [www.cardinalcorp.com](http://www.cardinalcorp.com).
- H. Substitutions: See Section 01 6000 - Product Requirements.

**202 INSULATING GLASS UNITS**

- A. Type IG-1 - Sealed Insulating Glass Units: Tinted glazing, low-E.
  - 1. Application: All west facing faces of the Great Hall.
  - 2. Basis of Design: Vitro Solarban 90 Solar Control Low-E Glass.
  - 3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: "Solexia".
    - b. Tint: Clear.
    - c. Coating: Low-E (solar control type), on #2 surface.
  - 4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: Clear.
  - 5. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
  - 6. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
  - 7. Total Thickness: 1 inch.
  - 8. Total Visible Light Transmittance: 36 percent, nominal.
  - 9. Total Solar Heat Gain Coefficient: 21 percent, nominal.
    - a. Minimum SHGC: 23 percent, nominal.
  - 10. Light to Solar Gain ratio (LSG): 1.71.
  - 11. Minimum Thermal Resistance (U-Value): 0.42, nominal.

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12. Glazing Method: Gasket glazing.
- B. Type IG-1 - Sealed Insulating Glass Units: Tinted glazing, low-E.
1. Basis of Design: Vitrol Solarban 70 Solar Control Low-E Glass.
  2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: "Solexia".
    - b. Coating: Low-E (solar control type), on #2 surface.
  3. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: Clear.
  4. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
  5. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
  6. Total Thickness: 1 inch.
  7. Total Visible Light Transmittance: 36 percent, nominal.
  8. Total Solar Heat Gain Coefficient: 21 percent, nominal.
    - a. Light to Solar Gain ratio (LSG): 1.71.
    - b. Minimum Thermal Resistance (U-Value): 0.42, nominal.
    - c. Glazing Method: Gasket glazing.
- C. Type IG-2 - Sealed Insulating Glass Units: Safety glazing:
1. Applications: Provide this type of glazing in the following locations:
    - a. Glazed lites in exterior doors.
    - b. Glazed sidelights and panels next to doors.
    - c. Other locations required by applicable federal, state, and local codes and regulations.
    - d. Other locations indicated on the drawings.
  2. Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
  3. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
  4. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
- D. Type S-1 - Single Vision Glazing:
1. Application: All interior glazing unless otherwise indicated.
  2. Type: Annealed float glass.
  3. Tint: Clear.
  4. Thickness: 1/4 inch.
  5. Glazing Method: Gasket glazing.
- E. Type S-3 - Single Safety Glazing: Non-fire-rated.
1. Application: Provide this type of glazing in the following locations:
    - a. Glazed lites in doors, except double glazed lites in doors, and fire doors.
    - b. Glazed sidelights to doors, except in double glazed sidelites, fire-rated walls and partitions.
    - c. Other locations required by applicable federal, state, and local codes and regulations.
    - d. Other locations indicated on the drawings.
  2. Type: Fully tempered float glass as specified.
  3. Tint: Clear.
  4. Thickness: 1/4 inch.
  5. Glazing Method: Gasket glazing.

## **203 EXTERIOR GLAZING ASSEMBLIES**

- A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.

2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
3. Glass thicknesses listed are minimum.

**204 GLASS MATERIALS**

- A. Float Glass Manufacturers:
  1. AGC Glass Company North America, Inc: [www.us.agc.com](http://www.us.agc.com).
  2. Guardian Industries Corp: [www.sunguardglass.com](http://www.sunguardglass.com).
  3. Pilkington North America Inc: [www.pilkington.com/na](http://www.pilkington.com/na).
  4. PPG Industries, Inc; [Basis of Design]: [www.ppgideascape.com](http://www.ppgideascape.com).
  5. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Float Glass: Provide float glass based glazing unless noted otherwise.
  1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
  2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
  3. Thicknesses: As indicated; for exterior glazing comply with specified requirements indicated for wind load design regardless of specified thickness.
- C. High Impact-Resistant Tempered Safety Glazing: Complying with 16 CFR 1201 test requirements for Category II.

**205 SEALED INSULATING GLASS UNITS**

- A. Manufacturers:
  1. Any of the manufacturers specified for float glass.
  2. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
  3. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Sealed Insulating Glass Units: Types as indicated.
  1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  2. Edge Spacers: Aluminum, bent or soldered corners.
  3. Edge Spacer Color: As selected by Architect.
  4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
  5. Purge interpane space with dry argon air.

**206 GLAZING COMPOUNDS**

- A. Manufacturers:
  1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  2. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com](http://www.momentive.com).
  3. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  4. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  5. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.
- C. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- D. Acrylic Sealant: Single component, solvent curing, non-bleeding; ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; with cured Shore A hardness range of 15 to 25; color as selected.
- E. Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

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- F. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; color as selected.
  - G. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

**207 GLAZING ACCESSORIES**

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; \_\_\_\_\_ color as selected.
- E. Glazing Clips: Manufacturer's standard type.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

**302 PREPARATION**

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions.

**303 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)**

- A. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

**304 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)**

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

- E. Trim protruding tape edge.

**3.05 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**

- A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.
1. Place glazing tape on glazing pane of unit with tape flush with sight line.
- F. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- G. Fill gap between glazing and stop with \_\_\_\_\_ sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
- H. Apply cap bead of \_\_\_\_\_ sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

**3.06 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)**

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

**3.07 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)**

- A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
- E. Fill gaps between pane and applied stop with \_\_\_\_\_ sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.

**3.08 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)**

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- B. Locate and secure glazing pane using glazers' clips.
- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

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**3.09 INSTALLATION - MIRRORS**

- A. Install mirrors in accordance with GANA recommendations.
- B. Install mirrors in correctly sized openings, using setting blocks (neoprene 80 to 90 Shore A durometer hardness), spacer shims, stainless steel clips, and adhesive compatible with mirror coating and wall substrate.
- C. Set mirrors plumb and level, free of optical distortion.
- D. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

**3.10 FIELD QUALITY CONTROL**

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

**3.11 CLEANING**

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

**3.12 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

**END OF SECTION**

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**SECTION 08 8300  
MIRRORS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Glass mirrors.
  - 1. Annealed float glass.
  - 2. Tempered safety glass.

**102 RELATED REQUIREMENTS**

- A. Section 06 2000 - Finish Carpentry: Wood mirror frames.

**103 REFERENCE STANDARDS**

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2021.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.
- H. GANA (GM) - GANA Glazing Manual; 2022.
- I. GANA (SM) - GANA Sealant Manual; 2008.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**105 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA (GM), GANA (SM), and \_\_\_\_\_ for glazing installation methods.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

**106 FIELD CONDITIONS**

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.



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**107 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Mirrors:
  - 1. Binswanger Mirror/ACI Distribution;\_\_\_\_\_: [www.binswangerglass.com/#sle](http://www.binswangerglass.com/#sle).
  - 2. Lenoir Mirror Co;\_\_\_\_\_: [www.lenoirmirror.com/#sle](http://www.lenoirmirror.com/#sle).
  - 3. Trulite Glass and Aluminum Solutions;\_\_\_\_\_: [www.trulite.com/#sle](http://www.trulite.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

**202 MATERIALS**

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
  - 1. Thickness: 1/4 inch.
  - 2. Edges: Square and lapped.

**203 GLAZING COMPOUNDS**

- A. Acrylic Sealant; Type\_\_\_\_\_: ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; clear color.

**204 ACCESSORIES**

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.
- C. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- D. Glazing Clips: Manufacturer's standard type.
- E. Mirror Attachment Accessories: Stainless steel clips.
- F. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
- G. J-Shape Frame: Aluminum extrusion, dimensions as detailed on drawings.
  - 1. Material: Comply with ASTM B221 (ASTM B221M), 6005-T6 alloy and temper.
  - 2. Finish: Anodized, clear.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

**302 PREPARATION**

- A. Clean contact surfaces with solvent and wipe dry.

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- B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
  - C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

**303 INSTALLATION**

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

**304 CLEANING**

- A. Remove wet glazing materials from finish surfaces.
- B. Clean mirrors and adjacent surfaces.

**END OF SECTION**

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**SECTION 08 9100  
LOUVERS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Louvers, frames, and accessories.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 07 6200 - Sheet Metal Flashing and Trim.
- C. Section 07 9005 - Joint Sealers.
- D. Division 23 - Mechanical Sections.

**103 REFERENCE STANDARDS**

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012, with Editorial Revision (2015).
- D. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).
- E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- F. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms; 2021.
- G. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; 2020.
- H. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- I. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- J. ASTM D2244 - Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.
- K. FEMA 361 - Design and Construction Guidance for Community Safe Rooms.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
- D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
- E. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

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**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

**106 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty against distortion, metal degradation, and failure of connections.
- C. Finish: Provide twenty year warranty against degradation of exterior finish.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Louvers:
  - 1. Airolite Company, LLC : [www.airolite.com](http://www.airolite.com).
  - 2. Construction Specialties, Inc: [www.c-sgroup.com](http://www.c-sgroup.com).
  - 3. Greenheck: [www.greenheck.com](http://www.greenheck.com)
  - 4. Nystrom: [www.nystrom.com](http://www.nystrom.com).
  - 5. Ruskin Company: BASIS OF DESIGN [www.ruskin.com](http://www.ruskin.com).

**202 LOUVERS**

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
  - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
  - 2. High-Velocity Wind Load Resistance: Design to comply with applicable requirements of ICC 500 and FEMA P-361, including resistance to horizontal debris impact.
  - 3. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
  - 4. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
  - 5. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.
- B. Stationary Louvers : Horizontal blade, extruded aluminum construction, with concealed intermediate mullions. Storm resistant.
  - 1. Manufacturers:
    - a. Greenheck: Model EHH.
    - b. Ruskin: Model EME520DD.
  - 2. Free Area: 57 percent, minimum.
  - 3. Blades: Drainable.
  - 4. Frame: 6 inches deep nominal, channel profile; corner joints mitered and, with continuous recessed caulking channel each side, and extended subsill.
  - 5. Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.
- C. Tornado Shelter Louvers: Louvers shall be prefinished extruded aluminum construction utilizing chevron style louver blades in a nominal 6" frame. Louver must be tested according to ICC-500 and UL labled. Finish to be mill finish.
  - 1. Manufacturers:
    - a. Ruskin: XP500

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- b. Greenheck: AFL-501
  - c. Substitutions: See Section 01 6000 - Product Requirements.
  - 2. Fabrication: Formed Aluminum stationary horizontal chevron louver style.
    - a. Frame:
      - 1) Frame Depth: 5 inches, nominal
      - 2) Wall Thickness: 0.25 inch, nominal
      - 3) Material: formed aluminum
    - b. Blades:
      - 1) Style: horizontal mounted chevron sight proof.
      - 2) Wall Thickness: 0.25 inch, nominal
      - 3) Material: formed aluminum.
    - c. Minimum assembly: 12 inches wide by 12 inches high.
    - d. Maximum assembly size: Unlimited width by 90 inches high
    - e. Maximum shipping width by 90 inches high:
      - 1) 300 PSF: On units up to 78 inches wide.
      - 2) 250 PSF: On units up to 90 inches wide.
      - 3) 200 PSF: On units up to 96 inches wide.
  - 3. Performance Data:
    - a. Free Area: 53 percent, nominal.
    - b. Maximum Recommended Air Flow through Free Area: 900 feet per minute.
    - c. Air Flow: 7600 cubic feet per minute.
    - d. Maximum Pressure Drop (intake): 0.30 inches w.g.
  - 4. Design Windload:
    - a. 300 PSF: On units up to 78 inches wide.
    - b. 250 PSF: On units up to 90 inches wide.
    - c. 200 PSF: On units up to 96 inches wide.

**203 MATERIALS**

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M) .
- B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.
- C. Insect Screen: 18 x 16 size aluminum mesh.
- D. Primer: Zinc chromate, alkyd type.

**204 FINISHES**

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

**205 ACCESSORIES**

- A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- B. Fasteners and Anchors: Stainless steel.
- C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

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**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

**3.02 INSTALLATION**

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- D. Secure louver frames in openings with concealed fasteners.
- E. Install perimeter sealant and backing rod in accordance with Section 07 9005.
- F. Coordinate with installation of mechanical ductwork.

**3.03 CLEANING**

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

**END OF SECTION**

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**SECTION 09 2116  
GYPSUM BOARD ASSEMBLIES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Metal stud wall framing.
- B. Metal channel ceiling framing.
- C. Shaft wall system.
- D. Fiber reinforced backing board.
- E. Gypsum wallboard.
- F. Moisture-Resistant board.
- G. Glass mat faced gypsum board sheathing.
- H. High-Impact gypsum board.
- I. Joint treatment and accessories.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 1400 - Fluid-Applied Air Barrier: Water-resistive barrier and air barrier over sheathing. Sealant for sheathing on which fluid-applied waterproofing will be applied.
- D. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- E. Section 07 2400 - Exterior Insulation and Finish Systems: Water Resistive Barrier over exterior wall sheathing.
- F. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
- G. Section 07 9005 - Joint Sealers: Acoustic sealant.

**103 REFERENCE STANDARDS**

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- H. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.



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- I. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.
  - J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.
  - K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
  - L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
  - M. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.
  - N. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2019.
  - O. GA-238 - Guidelines for the Preventions of Mold Growth on Gypsum Wallboard; 2003.
  - P. GA-253 - Recommended Specifications for the Application of Gypsum Sheathing; Gypsum Association; 1999.
  - Q. GA-600 - Fire Resistance and Sound Control Design Manual; 2021.
  - R. GA-801 - Handling and Storage of Gypsum Panel Products: A Guide For Distributors, Retailers, and Contractors; 2007.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- C. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
- D. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

**105 QUALITY ASSURANCE**

- A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
  - 1. Maintain one copy of standards at project site.
  - 2. Where indicated, provide materials and construction which are identical with those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.
- B. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.
- C. Single Source Responsibility: Comply with one of the following:
  - 1. Obtain all steel framing and all metal trim from a single manufacturer.
  - 2. Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
  - 3. Provide a confirmation letter from both the gypsum board manufacturer and the joint compound manufacturer that their products are compatible and warrantable if used together.
- D. Pre-Construction Conference: Prior to beginning work associated with roof system, the Contractor and appropriate subcontractors shall meet to discuss coordination of the work of the trades associated with the installation of the roof system, suspended acoustical and gypsum board ceiling, suspended mechanical ductwork, suspended light fixtures, etc. This work shall be planned and coordinated to provide hanger attachments needed by the various trades in a manner that will minimize conflict with installation of the roof system.

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**106 MOCK-UP**

- A. Include Gypsum Board Assemblies in Mock-Up as described in Section 01 4000 - Quality Requirements.

**107 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire rated assemblies as indicated on drawings.

**108 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. When materials are moved into the building, distribute pallets and loads evenly around work areas so as to avoid overloading structure, causing damage to any materials, interfering with work of other trades, etc.
- D. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads, trim, etc.

**PART 2 - PRODUCTS**

**201 METAL FRAMING MATERIALS**

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
1. Aegis Metal Framing, LLC.
  2. ClarkDietrich Building Systems: [www.clarkdietrich.com](http://www.clarkdietrich.com).
  3. Marino/WARE Industries, Corp.: [www.marinoware.com](http://www.marinoware.com).
  4. MBA Metal Framing: [www.mbastuds.com](http://www.mbastuds.com).
  5. SEMCO, Southeastern Metals, Div of Gibraltar Industries.
  6. Steel-Con; Div. of Steel Construction Systems.
  7. Telling Industries, LLC.
- B. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf. Install with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and minimum depth as follows:
1. Metal studs at interior partitions shall have web depth of 3-5/8-inches or 6-inches at locations indicated on the drawings, and a minimum base metal thickness of 0.0296-inches, spaced at 16-inches o.c., unless indicated otherwise below or otherwise shown on drawings or required by project conditions. EQ studs allowed for spans up to 16'-0" vertically when 3rd party test data (e.g. ICC-ES report) is provided.
  2. Jamb studs shall be no less than 20 gauge.
    - a. Studs shall be joined together at 4'-0" intervals.
  3. Use double studs or 6-inch studs, as indicated or as otherwise required, for chase walls, piping, conduits, or etc.
  4. Special stud tracks for curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK.
  5. Runners: U shaped, sized to match studs.
  6. Ceiling Channels: C-shaped.
  7. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

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8. Resilient Furring Channels: 1/2 inch depth, 25 gauge minimum, for attachment to substrate through one leg only.
- C. Steel Framing Components for Suspended and Furred Ceilings:
1. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.
  2. Wires for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.
  3. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
  4. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:
    - a. Thickness: 20 gauge, unless otherwise indicated.
    - b. Depth: As indicated.
    - c. Spacing: As indicated in referenced standard and on drawings, but no less than at all edges and 24-inches o.c.
  5. Steel Rigid Furring Channels: ASTM C645, hat-shaped, depth of 7/8-inch, and minimum thickness of base (uncoated) metal as follows:
    - a. Thickness: 20 gauge at interior and 18 gauge at exterior, unless otherwise indicated.
    - b. Spacing: As indicated in referenced standard and on drawings, but not less than at all edges and 16-inches o.c.
      - 1) At ceilings and soffits indicated to receive more than a single layer of gypsum board, spacing shall be not less than at all edges and 16-inches o.c.
  6. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.
    - a. Locations for Use: Provide grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system; Minimum 4-feet x 4-feet grid and cross tees at 2-feet o.c., with minimum installation requirements as required by manufacturer's current written instructions, referenced standards, and as indicated in this Section and Section 09 5100 - "Suspended Acoustical Ceilings". Provide and comply with manufacturer's published requirements for accessories, trim and hanger wire, and as otherwise required to provide flat ceilings without deflection or sag.
    - b. Product/Manufacturer: Provide suspended modular grid furring system equivalent to standard drywall suspension system for flat ceilings, with 1-1/2-inch grid faces, and as follows:
      - 1) Equivalent to "Drywall Suspension System", as manufactured by USG Interiors, or one of the other above named manufacturers.
- D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.
1. Bottom Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, unpunched unless otherwise indicated, of size, shape and gauge indicated, with 1-5/16-inch flange.
  2. Deflection Track: Typical at stud walls up to slab or similar fixed structure at top of walls: Provide for no less than 1" of vertical movement, equivalent to one of the following:
    - a. Deep Leg Track System
    - b. Track-Over-Track System
    - c. Slotted Track System

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3. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK.
  4. Special stud tracks for all arched walls shall be equivalent to "Flex-C Arch" galvanized flexible segmented track with slidable straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK.
  5. Provide deflection track at exterior wall and floor-to-floor walls - typical.
- E. Continuous Horizontal Bridging/bracing:
1. 1-1/2-inch cold-rolled channels (galvanized); 0.0538-inch minimum bare metal G60.
  2. Spacing: 4'-0" or 4'-6" o.c. vertically, through pre-punched slots in studs.
  3. Splice Plates: 16 gauge at all splices.
  4. Anchors (bridging channels to studs): 1-1/2-inches x 2-inches x 16 gauge clip angle, 1/4-inch less than stud width, secured with four (4) 5/8-inch S-14 screws. (Anchors required at ends of runs, where snap-in fit to stud slots is not snug or allows stud to move/slide on channels, and at studs on each side of splices in bridging channels).
- F. Strap Bracing/Blocking: 16 gauge steel flat strapping/blocking, minimum 6" width. Provide with manufacturer's recommended attachment.

## **202 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  2. Georgia-Pacific Corp.
  3. Gold Bond Building Products Div., National Gypsum Company.
  4. United States Gypsum Company.
- B. Impact Resistant Wallboard:
1. Application: High-traffic areas indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
  4. Type: Fire-resistance-rated Type X, UL or WH listed.
  5. Thickness: 5/8 inch.
  6. Edges: Tapered.
  7. Location: All interior surfaces to receive impact resistant wallboard up to 8'-0" A.F.F.
  8. Products:
    - a. National Gypsum Company; Gold Bond Hi-Impact Brand XP Wallboard.
    - b. Sheetrock brand Mold Tough VH1 Firecode gypsum panels.
    - c. Temple-Inland Building Product by Georgia-Pacific, LLC; ComfortGuard IR Impact Resistant.
- C. Gypsum Wallboard: Paper-faced as defined in ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut, and as follows:
1. Application: Use for vertical surfaces and horizontal surfaces, unless otherwise indicated.
  2. Fire Resistant Type: Type X board (UL or WH listed) at all locations, unless other type is required by indicated tested assembly.
  3. Thickness (unless indicated otherwise):
    - a. Vertical Surfaces: 5/8 inch.
    - b. Ceilings: 1/2 inch.
  4. Edges: Tapered.
- D. Moisture and Mold-Resistant Paper-Faced Products:

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1. Core Type: Type X.
  2. Thickness: 5/8 inch.
  3. Edges: Tapered.
  4. Application: At rooms with toilet fixtures and/or service sinks, entire wall behind sinks, and elsewhere as indicated or wherever water-resistant gypsum board is indicated.
  5. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
  6. Product:
    - a. Georgia Pacific ToughRock Mold-Guard.
    - b. USG Sheetrock brand "Mold Tough" gypsum panels.
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- E. Backing Board For Tile:
1. Fiber-Reinforced Gypsum Panels: As defined in ASTM C1278, mold-resistant, and with water-resistant core. No paper face.
  2. Thickness: 5/8 inch.
  3. Product:
    - a. Georgia Pacific "DensShield Tile Backer".
    - b. USG Fiberock brand "Aqua-Tough" Tile backerboard.
    - c. Substitutions: See Section 01 6000 - Product Requirements.
  4. Application: Wall surfaces behind tile.
- F. Gypsum Exterior Sheathing Board: Glass Mat gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face, back and long edges with glass mats; complying with ASTM C 1177 and requirements indicated below:
1. Type: Type X at all locations. (Noncombustible.)
  2. Edge and End Configuration: Square.
  3. Thickness: 5/8-inch, unless indicated otherwise.
  4. Size: 4'-0" x 8'-0" or 9'-0" as required for coordination with framing.
  5. Products:
    - a. Georgia Pacific "DensGlass Sheathing".
    - b. CertainTeed Gypsum "GlasRoc Sheathing".
    - c. Continental Building Products: [www.continental-bp.com](http://www.continental-bp.com) "Weather Defense Platinum Type X".
    - d. Gold Bond "eXP Extended Exposure Sheathing".
    - e. USG "Securock Exterior Sheathing".
  6. Joints: Sealed and facing-taped joints. Polyurethane joint sealant reinforced with fiberglass mesh tape encapsulated in the sealant. Sheathing fastener heads shall be encapsulated with polyurethane sealant. Fiberglass reinforcement is not needed at sheathing fastener heads. NO acrylic latex sealant shall be used.
  7. Extent: For Exterior sheathing, where plywood or other wood sheathing is not indicated.

### **203 GYPSUM BOARD ACCESSORIES**

- A. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
  1. Types: As detailed or required for finished appearance.
  2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
- B. Extruded Moldings and Reveal Moldings: Provide manufacturer's standard alloy 6063-T5 extruded units with 70% resin 2-coat "Kynar 500" baked enamel finish, and as follows:

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1. Design: Provide shapes and configurations as indicated on the Drawings.
    - a. Form reveal moldings to cover at least two sides and rear of reveal.
    - b. At drywall (or plaster) edge, provide continuous expanded metal edge, designed for mudding-in.
    - c. At ceiling grid edge, provide continuous edge designed for compatibility with lay-in ceiling grid.
    - d. Wall to gypsum ceiling reveal: provide continuous reveal molding equal to Fry Reglet "Z" reveal: with 1/2" wide reveal. Paint to match ceiling.
  2. Color: To match ceiling grid in same room where occurs, unless indicated otherwise, and color as selected by Architect at any exterior locations.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners of glass-mat faced boards, and where recommended by manufacturer. Joint material shall be compatible with and approved by air barrier manufacturer, where applicable.
  2. Tape: 2 inch wide, creased paper tape for joints and corners of paper faced boards, and where recommended by manufacturer.
- D. Level 5 Surface System Options:
1. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
  2. Factory-Applied Skim-Coated Drywall with matching Joint Compound: Rapid Deco Level 5 System by Lafarge.
- E. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated or other corrosion resistant material exceeding 800 hour ASTM B117 testing, for exterior locations.
- F. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.
- G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- H. Adhesive for Attachment to Wood, ASTM C557.

### **PART 3 - EXECUTION**

#### **301 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.
  1. Environmental Requirements, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840, with gypsum board manufacturer's recommendations, and with adhesive manufacturer's recommendations, for before, during, and after installation.
  2. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40°.
  3. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

#### **302 SEQUENCING AND SCHEDULING**

- A. Sequence installation of gypsum board and sheathing with installation of exterior cladding and roofing to comply with requirements indicated below:

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1. Do not leave gypsum sheathing board exposed to weather after its application for more than one month or, if protected as indicated below, for more than 6 months, unless otherwise warranted by manufacturer:
    - a. Cover exterior surface of sheathing with a temporary air infiltration barrier equivalent to 6-mil polyethylene film. Apply covering immediately after sheathing is installed.
    - b. Remove covering just prior to installation of asphalt felt, face brick, and similarly applied exterior materials.

### **3.03 SHAFT WALL INSTALLATION**

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
  1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
  2. Install studs at spacing required to meet performance requirements.
- B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
  1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
  2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

### **3.04 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.
- C. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center minimum.
  1. Level ceiling system to a tolerance of 1/1200.
  2. Laterally brace entire suspension system.
  3. Suspend ceiling hangers from building structural members and as follows:
    - a. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
    - b. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapeze or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
    - c. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
    - d. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
    - e. Secure hangers to structural support by connecting directly to structure where possible; otherwise, connect to anchorage devices or fasteners as indicated or required.
    - f. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
    - g. Do not attach hangers to steel deck tabs.
    - h. Do not attach hangers to steel roof deck. Attach hangers to structural members.

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- i. Do not connect or suspend steel framing from ducts, pipes or conduit.
  - j. Keep hangers and braces 2-inches clear of ducts, pipes and conduits.
  - k. Sway-brace suspended steel framing with hangers used for support.
  - l. Install suspended steel framing components in sizes and at spacing indicated but not less than that required by referenced steel framing installation standard
    - 1) Wire Hangers: 12 gauge, 4-feet on center. Install supplementary hangers as necessary at ceiling fixtures to provide a hanger at each corner of each fixture, diffuser, grille, and other ceiling-mounted equipment.
  - m. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track.
4. Install bracing as required at exterior locations to resist wind uplift.
- D. Studs: Space studs at 16 inches on center.
- 1. Extend partition framing to structure in all locations unless otherwise indicated.
  - 2. Installation Tolerances: Install each steel framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.
  - 3. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
  - 4. Extend non-bearing wall partition framing to 6 inches above adjacent ceiling heights, except where partitions are indicated to terminate at suspended ceilings.
    - a. Provide studs up to tie to structure at 4'-0" o.c. minimum, from partitions terminating below ceilings
  - 5. Install steel studs and furring in sizes and at spacings, indicated but not less than that required by referenced steel framing installation standard.
  - 6. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.
  - 7. Install horizontal steel bridging/bracing in all walls, and the additional strap bracing at curved walls as steel framing progresses. Install in compliance with stud manufacturer's recommendations, at spacing indicated
    - a. Galvanized steel strap bracing shall be provided continuous at top and bottom runner tracks and at bridging locations at all curved stud walls.
  - 8. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:
    - a. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
    - b. Where partition and wall framing abuts overhead structure:
      - 1) Unless framing is specifically indicated to terminate below ceilings, all framing and gypsum board shall extend up to bottom of structure above.
  - 9. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
  - 10. Install runners (tracks) at floors, ceilings and structural walls and columns, where gypsum drywall stud system abuts other construction.
- E. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- 1. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.



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- a. Extend vertical jamb studs (double studs-typical) through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.
  2. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
  3. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32-inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- F. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
1. Orientation: Horizontal.
  2. Spacing: At 16 inches on center minimum.
- G. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.
- H. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame openings, toilet accessories, hardware, and heavy trim, shelving, furnishings and equipment services. Attach metal blocking to studs using manufacturer's recommended method. Bolt or screw steel channels to studs. Utilize 16 gauge flat strapping/blocking minimum 6" width. For all other trades, comply with Section 06 1000 for wood blocking.

### **305 BOARD INSTALLATION**

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. General application and finishing of gypsum Board:
  1. Cut boards as recommended by manufacturer.
  2. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24-inches in alternate courses of board.
  3. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24-inches.
  4. Install wall/partitions boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.
  5. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.
  6. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
  7. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
  8. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
    - a. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except inside double or chase walls which are required to be braced internally.

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- 1) Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
  - 2) Fit gypsum board around ducts, pipes, and conduits.
  - 3) Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.
  - b. Fire-stop around penetrations as required by Codes and authorities having jurisdiction. Refer to Section 07 8400 for additional information and requirements
  9. Where interior partitions are indicated to extend to the structure above, the drywall shall also extend to the structure with the same number of layers as required below the ceiling.
  10. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 1/2-inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.
  11. Gypsum panels applied to walls shall be applied with the bottom edge spaced a minimum of 1/4-inch above the floor.
  12. At all interior walls, seal construction at perimeters of partition, partition intersections, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.
    - a. Offset boxes and similar openings minimum of one stud space, and insulate behind openings.
    - b. Openings cut into wall for boxes shall leave maximum gap of 1/4" around box.
    - c. Seal around box completely with acoustical sealant, or gasket recommended by manufacturer for acoustic isolation.
  13. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations
- C. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
1. Install gypsum wallboard as follows:
    - a. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
    - b. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated or required for fire or smoke resistive rated assemblies. Provide maximum length panels, to minimize end joints.
    - c. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
  2. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:
    - a. Fasten with screws
- D. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
1. Install gypsum backing board for base layer and gypsum wallboard for face layer.
  2. On ceilings apply base layer(s) prior to base layer application on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10-inches. Apply base layers at right angles to supports unless otherwise indicated.

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3. On partitions/walls apply base layer(s) and face layers vertically (parallel to framing) with joints of base layers over supports and face layer joints offset at least one stud or furring member space from base layer joints.
  4. Multi-Layer Fastening Methods:
    - a. Apply base layer(s) of gypsum board and face layer to base layer(s) as follows:
    - b. Fasten both base layer(s) and face layer separately to supports with screws
  - E. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
  - F. Exterior Sheathing: Comply with ASTM C 1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
    1. Fasteners spaced approximately 8-inches o.c. and set back 3/8-inch minimum from edges and ends of boards.
    2. Cut boards at penetrations, edges and other obstructions of the work; fit tight against abutting work, except provide 3/8-inch setback where non-loadbearing work abuts structural elements at head and jambs.
    3. Coordinate installation of sheathing with installation of flashing and joint sealers so that these combined materials are installed in the sequence and manner which prevents exterior moisture from passing through complete exterior wall assembly to the interior.
    4. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
    5. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match spacing of structural support elements
  - G. Fiber-Reinforced Gypsum Panels: Install in strict accordance with manufacturer's instructions.
  - H. Glass Mat Faced Gypsum Board: Install in strict accordance with manufacturer's instructions.
  - I. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.
  - J. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
    1. Single-Layer Applications: Adhesive application.
    2. Double-Layer Application: Install base layer using screws. Install face layer using adhesive.
  - K. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.
  - L. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

### **3.06 INSTALLATION OF TRIM AND ACCESSORIES**

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Control Joints: Place control joints consistent with lines of building spaces, as indicated on drawings or as follows:
  1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
  2. At exterior soffits, not more than 30 feet apart in both directions.
  3. Install control joints at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.
- C. Corner Beads: Install at external corners, using longest practical lengths.
- D. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

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**307 JOINT TREATMENT**

- A. General: Apply treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.
- B. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
  - 1. Joint tape and joint compound shall be compatible with waterproofing subsequently applied.
- C. Fiber Reinforced Gypsum and Cement Board: Use alkali-resistant glass fiber tape, recommended by manufacturer, embedded in latex-fortified mortar or latex-based Type 1 mastic over the joint. Use same material as specified for tile setting.
- D. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  - 4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
  - 5. Level 0: Temporary partitions.
- E. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
  - 3. Taping, filling, and sanding are not required at base layer of double-layer applications.
- F. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- G. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- H. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:
  - 1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
  - 2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
  - 3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.
- I. Water-Resistant Gypsum Board and Exterior Gypsum Board: Finish joints between water-resistant backing board with tape and setting-type joint compound to comply with gypsum board manufacturer's written recommendations and installation standards referenced in related sections.
- J. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing, except where finishing is required to achieve fire-resistance rating, sound rating or to act as air or smoke barrier
- K. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
  - 1. Option: Rapid Deco Level 5 System by Lafarge North America.

**308 CLEANING AND PROTECTION OF WORK**

- A. Promptly remove any joint compound and adhesives and similar residue from adjacent surfaces, as it may occur.

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- B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction remain without damage or deterioration at time of Substantial Completion.

**3.09 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**3.10 FINISH LEVEL SCHEDULE**

- A. Level 1: Above finished ceilings concealed from view.
- B. Level 2: Utility areas and areas behind cabinetry.
- C. Level 3: Walls scheduled to receive textured wall finish.
- D. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.
- E. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

**END OF SECTION**

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**SECTION 09 3000  
TILING**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Ceramic trim.
- D. Non-ceramic trim.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 07 9005 - Joint Sealers.
- C. Section 09 2116 - Gypsum Board Assemblies: Description and installation of tile backer board.

**103 REFERENCE STANDARDS**

- A. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.
  - 1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017 (Reaffirmed 2022).
  - 2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.
  - 3. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2021).
  - 4. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
  - 5. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2019.
  - 6. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2021.
  - 7. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
  - 8. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
  - 9. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
  - 10. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
  - 11. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
  - 12. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
  - 13. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
  - 14. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

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- 15. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.
  - 16. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
  - B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
  - C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2023.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives. Include test results where indicated.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on one plywood panel, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Samples: Submit two each 3 by 3 inch tile samples for color and product verification.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Tile: 2 percent of each size, color, and surface finish combination but not less than 10 square feet of each type.

**106 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

**107 MOCK-UPS**

- A. Include Tiling in Mock-Up as described in Section 01 4000 - Quality Requirements.

**108 DELIVERY, STORAGE, AND HANDLING**

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

**109 FIELD CONDITIONS**

- A. Do not install solvent-based products in an unventilated environment.

**PART 2 - PRODUCTS**

**201 TILE**

- A. Manufacturers:
  - 1. See Drawings for manufacturers.
  - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Porcelain Floor Tile

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1. See Drawings for products.
  2. Colors, Sizes, and Patterns: See Finish Plan and Finish Legend.
- C. Porcelain Wall Tile
1. See Drawings for products.
  2. Colors, Sizes, and Patterns: See Interior Elevations and Finish Legend.
- D. Floor Tile Coefficient of Friction:
1. Minimum Slip Resistance: Dynamic Coefficient of Friction, per ANSI A137.1-2012, shall be 0.42 (per the DCOF AcuTest) for any tile used on walking surface.

## **202 TRIM AND ACCESSORIES**

- A. Porcelain/Ceramic Trim: Matching bullnose shapes in sizes coordinated with field tile.
1. Applications:
    - a. Open Edges: Bullnose.
    - b. Inside Corners: Jointed.
    - c. Floor to Wall Joints: Cove base, unless indicated otherwise.
  2. Manufacturers: Same as for tile.
- B. Non-Porcelain/Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
    - a. Open edges of wall tile.
    - b. Open edges of floor tile.
    - c. Wall corners, outside and inside.
    - d. Transition between floor finishes of different heights.
      - 1) Schluter Reno, or as indicated on drawings.
    - e. Thresholds at door openings.
    - f. Expansion and control joints, floor and wall.
    - g. Floor to wall joints.
    - h. Borders and other trim as indicated on drawings.
  2. Manufacturers:
    - a. Schluter-Systems: [www.schluter.com/#sle](http://www.schluter.com/#sle).
    - b. Genesis APS International: [www.genesis-aps.com/#sle](http://www.genesis-aps.com/#sle).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- C. Thresholds: Marble, color - as selected, honed finish; 2 inches wide (unless indicated otherwise) by full width of wall or frame opening; 1 inch thick (nominal); beveled one long edge with radiused corners on top side; without holes, cracks, or open seams. Fabricated in the sizes and profiles indicated.
1. Applications:
    - a. Where indicated.

## **203 ADHESIVE/BOND COAT MATERIALS**

- A. Manufacturers:
1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  2. Mapei Corporation: [www.mapei.com](http://www.mapei.com).
  3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Adhesive: Latex-Portland Cement Mortar Bond Coat, ANSI A118.4.

## **204 GROUTS**

- A. Manufacturers:
1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).



2. Custom Building Products; \_\_\_\_\_: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
  3. LATICRETE International, Inc; \_\_\_\_\_: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
  4. Hydroment.
  5. Mapei Corporation: [www.mapei.com](http://www.mapei.com).
  6. StarQuartz Industries, Inc.: [www.StarQuartz.com](http://www.StarQuartz.com).
  7. Substitutions: See Section 01 6000 - Product Requirements.
- B. Grout: 100% solids epoxy grout as specified in ANSI A118.3 - most current standard.
1. Colors: To be selected by Architect from manufacturer's full range.
  2. Locations: At all locations, unless noted otherwise.

### **205 SETTING-BED MATERIALS**

- A. Mortar Bed Materials: Portland cement, sand, latex additive, and water.
- B. Waterproofing Membrane: Equivalent to "ECB Anti-Fracture Membrane", as manufactured by NAC Products, Inc.; Cuyahoga Falls, Ohio (Phone: 1-800-633-4622).
1. Provide complete system, including substrate primer/sealer, 40-mil, two component, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.
  2. Locations for Use: Below all tile flooring, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.
  3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.
- C. Substitutions: See Section 01 6000 - Product Requirements.

### **206 ACCESSORY MATERIALS**

- A. Cleavage Membrane: No. 15 asphalt saturated felt; complies with ANSI 108.02-3.8.
- B. Vapor Retarder Membrane at Walls: No. 15 (6.9kg) asphalt saturated felt. Complies with ANSI A108.02-3.8.
- C. Waterproofing Membrane: Equivalent to "ECB Anti-Fracture Membrane", as manufactured by NAC Products, Inc.; Cuyahoga Falls, Ohio (Phone: 1-800-633-4622).
1. Provide complete system, including substrate primer/sealer, 40-mil, two component, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.
  2. Locations for Use: Below all tile flooring, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.
  3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.
- D. Substitutions: Section 01 6000 - Product Requirements.
- E. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.
- F. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape, complies with ASTM C475.

## **PART 3 - EXECUTION**

### **301 EXAMINATION**

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

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- D. Verify that required floor-mounted utilities are in correct location.

**3.02 PREPARATION**

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

**3.03 INSTALLATION - GENERAL**

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings. Align joints of wall base and wall tile with those in floor tile.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Use manufacturer's recommended grout joint width. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Install non-ceramic trim in accordance with manufacturer's instructions.
- H. Install thresholds where indicated.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep control and expansion joints free of mortar, grout, and adhesive.
- K. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- L. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- M. Grout tile joints. Use standard grout unless otherwise indicated. Use epoxy grout unless otherwise indicated.
- N. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
- O. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

**3.04 INSTALLATION - FLOORS - THIN-SET METHODS**

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F131, epoxy bond coat and grout, unless otherwise indicated.
  - 1. Use waterproofing membrane under all tile.
  - 2. Where waterproofing membrane is indicated, install as recommended by manufacturer, and in accordance with applicable TCA Handbook Method.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

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**3.05 INSTALLATION - FLOORS - MORTAR BED METHODS**

- A. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with grout as indicated in finish schedule on Drawings.
- B. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
  - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.
  - 2. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F132, bonded.
  - 3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCNA (HB) Method F114, with cleavage membrane.
- C. Cleavage Membrane: Lap edges and ends.
- D. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

**3.06 INSTALLATION - WALL TILE**

- A. Over interior cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244C, using waterproof membrane, and epoxy grout.
- B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.
- C. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202 thin-set with epoxy bond coat and grout.

**3.07 CLEANING**

- A. Clean tile and grout surfaces.

**3.08 PROTECTION**

- A. Do not permit traffic over finished floor surface for 4 days after installation.

**3.09 SCHEDULE**

- A. See Finish Schedule on Drawings.

**END OF SECTION**

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**SECTION 09 5000  
METAL CEILINGS**

**PART 1 - GENERAL**

**101 REFERENCE STANDARDS**

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- B. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2019).
- C. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2023.
- D. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test; 2022.
- E. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2019.

**102 SUMMARY**

- A. Section Includes:
  - 1. Suspended Metal / SoftSound Panel Ceilings & Walls
  - 2. Cable hangers and fasteners
- B. Related Sections:
  - 1. Division 23 (15) Sections - HVAC
  - 2. Division 26 (16) Sections – Electrical
  - 3. Section 09 54 00 Specialty Ceilings
  - 4. Section 09 53 00 (09500) – Acoustical Ceiling Suspension Assemblies

**103 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
  - 2. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 3. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems

**104 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Provide panels and method of attachment by a single manufacturer.
- B. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

**105 DELIVERY, STORAGE, AND HANDLING**

- A. Store the metal ceiling panels in an interior location and keep in cartons prior to installation to avoid damage and where they will be protected against damage from moisture, direct sunlight, surface contamination, etc.
- B. Exercise care in moving and opening cartons to prevent damage to the panel face.
- C. Handle panels carefully to avoid damaging units in any way.

**106 PROJECT CONDITIONS**

- A. Space Enclosure:
  - 1. Building areas to receive panels shall be free of construction dust and debris. Products can be installed up to 100°F (38°C) with humidity not exceeding 90% RH. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the

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panels. Following installation, conditions must be maintained below 70% RH or near those intended for final occupancy.

**107 WARRANTY**

- A. Metal Panels: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to:
  - 1. Panels: Manufacturing defects.
  - 2. Attachment devices: Rusting and manufacturing defects.
- B. Warranty Period:
  - 1. Panels: One (1) year from date of substantial completion.
  - 2. Attachment devices: One (1) year from date of substantial completion.
- C. C. Warranty Language:
  - 1. Manufacturer's products are expressly warranted for a period of one (1) year from purchase to be free from defects in material and workmanship, when installed according to manufacturer's published installation procedures. During the warranty period manufacturer will repair or at its option replace the products that are proven to be defective. Manufacturer is NOT responsible for any intentional or accidental abuse, misuse, or neglect incurred on the original warranted product, and shall as determined by manufacturer, void the warranty.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Vapor® ( Trail) - Torsion Spring Ceiling and Wall Panels and Arktura Backlight:
  - Arktura – Gardena, CA
  - Phone: 310.532.1050
  - Email: info@arktura.com
- B. Substitutions: See Section 01 6000-Product Requirements.
- C. Suspension System for Custom Perforated Ceiling Panels:
  - 1. Armstrong (or equal)
    - 7301TS** - Prelude XL 12' HD Main Beam slotted for torsion spring
    - XL7328** - Prelude XL 2' Cross Tee
    - 7147 WH** - Torsion spring perimeter trim (extruded)
  - a. **7871 WH** - (alternate trim) W Mold
  - 7131 WH** - Torsion spring perimeter trim -2 part (must use when adjacent to Arktura wall channel mount system)
  - 7126** - Spreader hold down clip

**202 PANEL UNITS**

- A. Panels:
  - 1. Surface Texture: Smooth see Section 2.3
  - 2. Composition: 0.06 Aluminum 5052
  - 3. Color: Color from RAL System
  - 4. Size: Aproximately 2' x 4'
  - 5. Perforation: custom algorithmically generated pattern by Arktura with varying sizes and shapes. Perforated pattern to be continuous across panelized system (panel edge to panel edge). Smooth inside cut faces.
  - 6. Recycled Content: 30% up to 60% recycled content upon request

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**203 SURFACE FINISH**

- A. Application of surface finish to be applied in compliance with the following standard operating procedure:
1. Inspect raw material for obvious defects.
  2. Pre-treat raw material with 3-6% iron phosphate rust inhibitor solution via pressure spray at 10-20 psi and 110-130 °F.
  3. Pre-heat raw material for 3-6 minutes at 400°F to dry.
  4. Electrostatically apply Triglycidyl Isocyanurate (TGIC) polyester powder primer (Dupont or equivalent) to entire surface of part at approximately 2.0-3.0 mils.
  5. Cure part per manufacturer's specifications.
- B. Surface finish, when complete, must meet the reference standards as listed below:
- American Society for Testing and Materials (ASTM):
1. ASTM D3359 Standard Test Methods for Measuring Adhesion, Method B
  2. ASTM D3363 Standard Test Method for Film Hardness by Pencil Test
  3. ASTM D2794 modified Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
  4. ASTM D522 modified Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
  5. ASTM D4060 modified Standard Test Method for Abrasion Resistance
- C. Durability of surface finish must meet the reference standards as listed below:
- American Society for Testing and Materials (ASTM):
1. ASTM B117 - 09 Standard Practice for Operating Salt Spray (Fog) Apparatus

**204 ATTACHMENT SYSTEM**

- A. Installation Hardware:
1. Ceiling: the custom engineered, prefabricated panels will be designed for an Armstrong Metalworks torsion spring grid suspension structure. The perimeter trim and other main tees in the suspension grid are part of the Armstrong Metalworks torsion spring system. The torsion springs themselves are supplied by Arktura with the custom perforated metal panels.
  2. Wall: the custom engineered, prefabricated panels will be designed for an Arktura Vertika Channel System. Perimeter trim and cap trim are part of Vertika assembly.

**PART 3 - EXECUTION**

**301 PREPARATION**

- A. To field verify each ceiling area as-built and establish coordinated layout of panels. Arktura to supply standard diagrams and instructions needed for panel installation. Panel sub-structure shall be level and plumb. Panel substructure shall be structurally sound as determined by an engineer. Panel substructure shall be free of defects detrimental to work and erected in accordance with established building tolerances.
- B. to coordinate panel layout and openings with mechanical, electrical and sprinkler fixtures as necessary.
- C. to coordinate delivery of such items to project site.

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**INSTALLATION**

- A. Install panels in accordance with Manufacturer's instructions and in compliance with the authorities having jurisdiction.
- B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- C. Erect panels' level and plumb, in proper alignment in relation to substructure framing and established lines.
- D. Panel anchorage shall be structurally sound and per engineering recommendations.
- E. Locate and place ceiling panels' level, plumb, and at indicated alignment with adjacent work.

**401 ADJUSTING AND CLEANING**

- A. Replace damaged and broken panels.
- B. Proper maintenance and regular servicing of the coated surfaces are both prerequisites for the claims of any guarantee and require regular cleaning at least once each year. For severe environmental pollution, for example in regions with increased salt contamination and/or chemical exhausts, meaning in a direct area of influence or within the vicinity of an industrial or chemical enterprise, or in the immediate vicinity of a sea coast or within a defined chemical/radioactive precipitation zone, the building must be cleaned more often. In this way possible damage can be made subject to timely recognition and remedied on time by suitable measures.
- C. If a coated component is soiled during transport, through storage or assembly, the cleaning of this component must take place immediately with clear, cold or lukewarm water. Neutral or a weak alkaline detergent can be used against severe soiling.
- D. D. Protect ceiling panel assemblies from damage during construction. Use temporary protective coverings where needed as approved by the ceiling panel manufacturer.

**END OF SECTION**

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**SECTION 09 5100  
ACOUSTICAL CEILINGS**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- D. Perimeter Trim.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 07 2100 - Thermal Insulation: Acoustical insulation.
- C. Section 07 9005 - Joint Sealers: Acoustical sealant.

**103 REFERENCE STANDARDS**

- A. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength Low Alloy with Improved Formability.
- B. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- C. ASTM A 653 (Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- D. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- E. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- F. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.
- G. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- H. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
- J. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- K. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
- L. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
- M. ASTM C 1264 Classification for Acoustical Ceiling Products.
- N. UL (FRD) - Fire Resistance Directory; Current Edition.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is



completed, tested, and approved.

- B. Do not install acoustical units until after interior wet work is dry.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6x6 inch in size illustrating material, edge detail and finish of acoustical units.
- E. Samples: Submit two samples each, 8 inches long, of suspension system main runner, cross runner, and perimeter molding.
- F. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**106 QUALITY ASSURANCE**

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.
  - 1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
  - 2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
  - 3. Fire Resistance: As follows tested per ASTM E 119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory.
- C. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- E. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

**107 DELIVERY, STORAGE AND HANDLING**

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

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**108 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.
- B. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

**109 WARRANTY**

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
  - 1. Acoustical Panels: Sagging and warping
  - 2. Grid System: Rusting and manufacturer's defects
- B. Warranty Period:
  - 1. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is Thirty (30) years from date of substantial completion.
  - 2. Acoustical panels and grid systems with Humidity/Sag Resistant Treatment supplied by one source manufacturer shall be warranted for Thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

**110 MAINTENANCE**

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
  - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 5.0 percent of amount installed.
  - 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.
- B. See Section 01 6000 - Product Requirements, for additional provisions.
- C. Deliver extra stock to Owner's representative.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Acoustic Tiles/Panels:
  - 1. Armstrong World Industries, Inc; [Basis of Design]: [www.armstrong.com](http://www.armstrong.com).
  - 2. USG Corporation: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Suspension Systems:
  - 1. Armstrong World Industries, Inc; [Basis of Design]: [www.armstrong.com](http://www.armstrong.com).
  - 2. USG Corporation: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).

3. Substitutions: See Section 01 6000 - Product Requirements.

**202 ACOUSTICAL UNITS**

- A. Acoustical Panels:  
1. As indicated on Ceiling Finish Legend.

**203 SUSPENSION SYSTEM(S)**

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
- B. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
1. Structural Classification: ASTM C 635 Intermediate Duty
2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 12 gauge.
- E. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
1. Products: See Ceiling Finish Key.

**204 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
- D. Perimeter Moldings: Same metal and finish as grid.
- E. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 9005.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

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- C. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

**302 PREPARATION**

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
  - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

**303 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, with authorities having jurisdiction, and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Use longest practical lengths.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- K. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
- L. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

**304 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions. Comply with ASTM C 636 and with authorities having jurisdiction.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

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- C. Lay directional patterned units with pattern parallel to longest room axis, unless indicated otherwise.
  - D. Fit border trim neatly against abutting surfaces.
  - E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
  - F. Cutting Acoustical Units:
    - 1. Cut to fit irregular grid and perimeter edge trim.
    - 2. Make field cut edges of same profile as factory edges.
    - 3. Double cut and field paint exposed reveal edges.
  - G. Where round obstructions occur, provide preformed closures to match perimeter molding.
  - H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.
  - I. Install hold-down clips on panels within 20 ft of an exterior door.
  - J. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
  - K. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

**305 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**306 ADJUSTING AND CLEANING**

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with new product to eliminate evidence of damage.

**END OF SECTION**

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**SECTION 09 6466  
WOOD ATHLETIC-FLOORING ASSEMBLIES**

**PART 1 - GENERAL**

**101 SUMMARY**

- A. This Section includes:
1. New maple, strip flooring system on subfloor, and related work. Floating resilient wood athletic floor system
  2. New striping and graphics, as indicated on Drawings and herein.

**102 DESCRIPTION**

- A. Related work specified under other sections.
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
  2. Concrete and Concrete Finishing - Section 03 3000.
    - a. Concrete Slab Depression: 1-3/4" using 25/32" flooring and subfloor for SB System.
    - b. Surface Finish: steel troweled and finished smooth.
    - c. Concrete Tolerance: 1/8" in radius of 10'.
    - d. Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
  3. Membrane Waterproofing and Dampproofing
    - a. Concrete subfloors on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on the earth side of below grade walls by general contractor using suitable type membrane.
    - b. Sand-Poly-Sand slab construction is not an acceptable construction.
  4. Thresholds - Section 08 7100.
  5. Game Standard Inserts - Section 11 6623.

**103 QUALITY ASSURANCE**

- A. Floor System Manufacturer Qualifications
1. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years.
  2. Manufacturer shall be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).
- B. Floor Contractor/Installer Qualifications and Certifications
1. Flooring contractor shall be a firm experienced in flooring field and approved by manufacturer.
  2. Submit a list of at least three completed projects of similar magnitude and complexity completed under current corporate identity.
- C. Surface Appearance
1. Expansion spaces will not exceed 1/64" at time of installation and will be spread evenly across the floor with each row of flooring.
  2. Expansion spacing will be installed to allow for normal expected increases in Equilibrium Wood Moisture Content (EMC).
- D. DIN Performance Testing
1. Passes all criteria of DIN 18032 part 2.

**104 SUBMITTALS**

- A. Manufacturer's Qualification Data

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1. Submit a list of at least three completed projects of similar magnitude and complexity under current corporate identity.
  - B. Manufacturer's Product Data
    1. Submit three copies of manufacturer's product information, drawings, and specification sheets.
    2. Suppliers shall submit certificates attesting that materials furnished will meet specifications for grade, quality, dryness and treatment, if required.
  - C. Concrete Guidelines
    1. Submit three copies of MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.
    2. Submit manufacturer's "Concrete Guide Specification" for further information regarding conditions and requirements of concrete prior to installation.
  - D. Samples
    1. Submit one sample of flooring assembly. Sample to be made by the manufacturer and so indicated.
  - E. Maintenance Literature
    1. Submit copy of Maintenance Instructions.

**105 DELIVERY, STORAGE AND HANDLING**

- A. Delivery of Materials
  1. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80 degrees Fahrenheit and relative humidity of 35-50% are to be maintained. In-Slab Relative Humidity shall be 85% or less using ASTM F2170 In-Slab Relative Humidity test. Ideal installation/storage conditions are the same as those that will prevail when building is occupied.
  2. Materials shall not be stored at the installation location if the In-Slab relative humidity level for the concrete slab is above 85% using ASTM F 2170 In-Slab Relative Humidity test.

**106 JOB CONDITIONS-SEQUENCY**

- A. Do not install floor system until concrete has cured 60 days and requirements in "Delivery of Materials" paragraph above are obtained.
- B. General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.
- C. Concrete slab shall be bead-blasted prior to installation of wood floor adhesive system to insure proper bond and eliminate foreign contaminants.
- D. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.
- E. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of area with specified flooring, he shall protect the floor by covering with non-fibred kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete gymnasium floor.

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**107 GUARANTEE**

- A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
- B. Manufacturer hereby warrants the Product material to be free from manufacturing defects for a period of 1 year.
- C. This warranty is in lieu of all other warranties, expressed or implied including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of manufacturer. In the event of breach of any warranty, the liability of the manufacturer shall be limited to repairing or replacing product and system components supplied by manufacturer and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS/PRODUCT**

- A. Robbins Sport Surfaces, Cincinnati, OH, 800-543-1913, [Basis of Design]:  
[www.robbsfloor.com](http://www.robbsfloor.com).

**202 MATERIALS**

- A. System: Bio-Channel SB System, or approved equal.
  - 1. Acceptable Manufacturers provided they meet guidelines for wood dimension and adhesive composition:
    - a. Conner Sports Flooring; "Focus": [www.connorfloor.com](http://www.connorfloor.com).
    - b. Horner Flooring; "Zenith LP": [www.hornerflooring.com](http://www.hornerflooring.com).
- B. Vapor Barrier
  - 1. 6-mil polyethylene.
- C. Subfloor
  - 1. Zero/G Lineal Strip shock pad.
  - 2. Bio-Channel SB Subfloor panels:
    - a. 25/32" factory engineered panels, on-site lamination shall not be permitted.
    - b. Pre-determined, factory routed locations to accept resilient Zero/G pad.
    - c. Pre-determined, factory routed locations to accept linear anchor channel.
  - 3. 16-gauge coated metal anchor channels.
- D. Maple Flooring
  - 1. 25/32" thick x 2-1/4" wide, 2nd and Btr Grade, Random length, unfinished TGEM, KD Northern Hard Maple, as manufactured by Robbins and graded in accordance with MFMA rules.
- E. Fasteners
  - 1. Flooring - 1-3/4" cleats or staples.
  - 2. Subfloor Channel Anchors - Powers SPIKE® anchors.
- F. MFMA Flooring - Finger-Jointed Northern Hard Maple.
  - 1. Grade 2 or better.
- G. Finishing Materials
  - 1. Robbins Miracle or approved equal oil-modified polyurethane sealer and finish.



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- H. Gamelines
    - 1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.
  - I. Perimeter Base - Robbins 3" x 4" ventilating type. (Color: As selected.)

**203 ACCESSORIES**

- A. Accessory items recommended by manufacturer for complete system.

**PART 3 - EXECUTION**

**301 INSPECTION**

- A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8" in a 10' radius. Moisture content of the concrete slab shall not exceed manufacturer recommendations using ASTM F 2170 In-Slab Relative Humidity test.
- B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the General Contractor.
- C. Subfloor shall be broom cleaned by General Contractor.
- D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.
- E. Area of floor shall be turned over to the Contractor free of all equipment and debris, and broom clean.

**302 INSTALLATION**

- A. Vapor Barrier
  - 1. Install polyethylene with joints lapped minimum 6" and turned up 4" at the walls.
- B. Subfloor
  - 1. Install manufacturer's resilient pads per manufacturer's recommendations.
  - 2. Place Bio-Channel SB subfloor panels diagonally to strip flooring, in an end-to-end manner, staggering end joints in adjacent rows. Allow a 1/4" gap between panels. Provide 1-1/2" to 2" expansion void at the perimeter and all vertical obstructions.
  - 3. Install solid stop blocking as needed.
- C. Anchoring
  - 1. Place anchor channel and anchor at each anchoring location. These anchor locations shall be perpendicular to the finished floor to allow for lateral movement. Anchors shall be driven tight to the concrete to insure proper placement. Anchors that need to be shimmed are not permitted.
- D. Maple Flooring
  - 1. Machine nail maple finish flooring per manufacturer's instructions. Provide spacing for humidity conditions in specific regions. Provide 2" expansion voids at perimeter and all vertical obstructions.

**303 FINISHING**

- A. Sanding
  - 1. Sand per manufacturer's recommendations.
  - 2. After sanding, buff entire floor with 100 grit screen or equivalent grit sandpaper, with a heavy-duty buffing machine.

- 
3. Inspect entire area of floor to insure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
  4. Vacuum and/or tack floor before first coat of seal.
  5. Floor should be clean and completely free of dirt and sanding dust.

**B. Finishing**

**1. Gymnasium:**

- a. Apply specified combination of seal, gameline paint, and finish in accordance with manufacturer's instructions.
- b. Buff and vacuum and/or tack between each coat after it dries.
- c. Apply game lines accurately after the buffing and vacuuming the coated surfaces. Game lines shall be painted between seal coats and finish coats. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.
  - 1) Game lines shall consist of Basketball Court striping and Volleyball Court striping. (See drawings for layout of courts, and for logo.) Include the following, and as indicated:
    - (a) Main court basketball.
    - (b) Cross court basketball.
    - (c) Main court volleyball.
    - (d) Logo/Graphics.
- d. Apply finish coats per manufacturer's recommendations.

**3.04 WALL BASE INSTALLATION**

- A. Install manufacturer's vent cove base anchored to walls with base cement or screws and anchors. Use pre-molded outside corners and neatly mitered inside corner.

**3.05 CLEANING**

- A. Clean up all unused materials and debris and remove it from the premises.

**END OF SECTION**

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**SECTION 09 6500  
RESILIENT FLOORING**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.
- D. Waterjet cutting of resilient flooring.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

**103 REFERENCE STANDARDS**

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).
- B. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2021a.
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week before starting work of this section.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- E. Verification Samples: Submit one sample, 9 by 9 inch in size illustrating color and pattern for each resilient flooring product specified, and two 3 by 3 inch samples.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Flooring Material: Provide minimum of 5% of each type and color.
  - 3. Extra Wall Base: Provide minimum of 5% of each type and color.
  - 4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

**106 QUALITY ASSURANCE**

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

- 
- B. Pre-Installation Testing: Conduct pre-installation testing as follows: Moisture tests, Bond test, and pH test.
  - C. Approved Waterjet Company:
    - 1. Waterjet Works! Philip Einsohn, 2621 Nova, Texas 75229. Phone 972-991-0972. Toll Free: 1-800-856-0972. Email: service@waterjetworks.com. Fax: 972-387-0484; Toll Free: 1-800-844-1443. OR Approved Equal.
    - 2. Hand cutting is not considered an option, and is not permitted.
    - 3. List prior history with resilient flooring.

**107 DELIVERY, STORAGE, AND HANDLING**

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
  - 1. Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68° F (20° C) for at least 48 hours prior to the installation.

**108 FIELD CONDITIONS**

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

**109 WARRANTY**

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
- C. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

**PART 2 PRODUCTS**

**201 RESILIENT TILE FLOORING**

- A. Luxury Vinyl Tile (LVT):
  - 1. Minimum Requirements: Comply with ASTM F 1700 Class III, Type B - Embossed Surface.
  - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
  - 3. Smoke Developed: 450 or less, when in accordance with ASTM E 662.
  - 4. Static Load Limit: 250 psi, when tested in accordance with ASTM F 970 (modified).
  - 5. Size: See Finish Legend.
  - 6. Wear Layer Thickness: 0.020 inch (nominal).
  - 7. Total Thickness: See finish legend.
  - 8. Durability: 0.125 inch - Very Good.
  - 9. Maintainability: 0.125 inch - Excellent.

- 
10. Resilience: 0.125 inch - Excellent.
  11. Manufacturer/ Style/ Color: See Finish Legend.
    - a. Interface; Studio Set
    - b. Patcraft; Timber Grove II
    - c. Shaw; Vertical Layers: Basis of Design
    - d. Substitutions: Reference Section 01 6000
  - B. Rubber Tile - Type\_\_\_\_: Homogeneous, color and pattern throughout thickness.
    1. Manufacturers:
      - a. Flexco Corporation: [www.flexcofloors.com/#sle](http://www.flexcofloors.com/#sle).
      - b. Johnsonite, a Tarkett Company;\_\_\_\_\_: [www.johnsonite.com/#sle](http://www.johnsonite.com/#sle).
      - c. Roppe Corporation; Rubber Tile: [www.roppe.com/#sle](http://www.roppe.com/#sle). [basis of design]
      - d. Substitutions: See Section 01 6000 - Product Requirements.
    2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
    3. Size: See Finish Legend.
    4. Total Thickness: See finish legend
    5. Color: As indicated on drawings.

## **202 STAIR COVERING**

- A. Stair Treads with Integral Risers: Rubber; full height of riser, full width and depth of tread in one piece; tapered thickness.
  1. Manufacturers:
    - a. Johnsonite, a Tarkett Company;\_\_\_\_\_: [www.johnsonite.com](http://www.johnsonite.com).
    - b. Mannington Commercial;\_\_\_\_\_: [www.manningtoncommercial.com#sle](http://www.manningtoncommercial.com#sle).
    - c. Roppe Corporation;\_\_\_\_\_: [www.roppe.com/#sle](http://www.roppe.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
  2. Nosing: Square.
  3. Color: As indicated on drawings.

## **203 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
  1. Height: See Finish Legend.
  2. Thickness: 0.125 inch.
  3. Finish: As selected by Architect.
  4. Length: Roll.
  5. Manufacturers:
    - a. Johnsonite, a Tarkett Company: [www.johnsonite.com](http://www.johnsonite.com).
    - b. Roppe Corporation; Basis of Design: [www.roppe.com](http://www.roppe.com)
    - c. Substitutions: See Section01 6000-Product Requirements.

## **PART 3 - EXECUTION**

### **301 EXAMINATION**

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

- 
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
    - 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
  - D. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
  - E. Verify that required floor-mounted utilities are in correct location.
  - F. Confirm tiles are square and true. Cull all non-conforming tiles.

**302 PREPARATION**

- A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is fully cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

**303 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's instructions. See finish plans for pattern and tile layout.
- C. Fit joints tightly. Window panes in tiles are not acceptable.

**304 INSTALLATION - TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. General Requirement: All resilient tile shall be from one manufacturer.
- D. Cutting of resilient tile:
  - 1. All cutting is to be done with waterjet technology.
  - 2. Tolerance between cuts is to be 0.002" (2/1000th of an inch).
  - 3. Waterjet cutting company is to be supplied an electronic file of the design.
  - 4. Includes cutting and assembly of the designs, and the field that surrounds.
  - 5. Waterjet machine must be "water only" cutting process. No abrasives in tank,
- E. Preparation for shipping of resilient tile:
  - 1. Each design shall be reassembled back into 16" x 16" square.
  - 2. Entire project shall be checked for accuracy prior to boxing which includes verifying that each assembled piece fits correctly.
  - 3. Tiles shall be packed in an appropriate 18" x 18" box with padding. No loose tiles on pallets.
  - 4. Each box shall have labels indicating contents of box.
  - 5. First box to be opened shall be clearly marked.
  - 6. Boxes shall be palletized and shrink wrapped.
  - 7. Waterjet cutting company shall be available in case of emergency.

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8. Installer to be notified in writing of the importance of having a smooth, flat surface.
  9. Shipment shall be insured by shipper.

**F. Installation of resilient tile:**

1. Installer shall dry lay all waterjet designs prior to final installation.
2. Installer shall notify waterjet company of any concerns prior to final installation.
3. Install according to manufacturer's recommendations.

**3.05 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 72 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

**3.06 INSTALLATION - STAIR COVERINGS**

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Adhere over entire surface. Fit accurately and securely.

**3.07 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax resilient flooring in accordance with manufacturer's instructions, and also upon coordination with manufacturer's representative and Architect.

**3.08 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**3.09 SCHEDULE**

- A. See Drawings.

**END OF SECTION**



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**SECTION 09 6623  
RESINOUS MATRIX TERRAZZO FLOORING**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Epoxy matrix terrazzo with ground and polished finish.
- B. Precast epoxy terrazzo stair units.
- C. Recessed mat frames within terrazzo field.
- D. Epoxy matrix terrazzo floor, border and base.
- E. Divider strips and recessed mat frames.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3000 - Cast-in-Place Concrete: Concrete subfloor. \_\_\_\_\_
- C. Section 07 9005 - Joint Sealers: Joint between terrazzo base and wall surface.
- D. Division 9 Sections - Other adjacent floor finish trades (for transition details).
- E. Division 22 Plumbing Section: Furnishing and Setting Floor Drains.

**103 REFERENCE STANDARDS**

- A. NTMA (SPECS) - Terrazzo Specifications; The National Terrazzo and Mosaic Association, Inc.; current edition located at [www.ntma.com](http://www.ntma.com).

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
  - 1. For tests not listed in published data, manufacturer shall supply missing data according to standard referenced. Provide information on: Physical properties, Performance properties, Specified tests, Material Safety Data Sheet, Manufacturer's standard warranty.
- C. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details and attachments to other work. Show layout of the following: Indicate divider strip and control joint layout, base and border strips, terrazzo patterns, abrasive strips, stair treads, risers and landings, expansion joint strips, and precast terrazzo jointing, edge configurations including anchorage details, and details of adjacent components.
- D. Samples for Initial Selection: Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.
- E. Samples for Verification: Match Architect's samples for each type, material, color and pattern of terrazzo and accessory required showing the full range of color, texture and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes and proportions. Prepare samples of same thickness and from same material to be used for the work in size indicated below:
  - 1. Epoxy Terrazzo: minimum 6" x 6" sample of each color and type of terrazzo.
  - 2. Precast Epoxy Terrazzo: minimum 6" x 6" sample of each color and type of terrazzo.
  - 3. Accessories: 6" length of each kind of divider strip, stop strip and control joint strip required.

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4. Stair Treads: 12" length wide sample combination tread/riser with cast-in nosing.
  - F. Manufacturer Experience:
    1. Submit proof of Associate membership in NTMA.
    2. Furnish a list of at least five (5) epoxy terrazzo projects using material being submitted for this project installed during the last five (5) years of the same scope, complexity and at least 50 percent of the square footage.
    3. Manufacturer must provide history of providing primary material for a minimum of five (5) years.
  - G. Qualification Data: For qualified Installer:
    1. Submit proof of Contractor membership in NTMA for 5 years in good standing.
    2. Furnish a list of at least five (5) epoxy terrazzo projects using material being submitted for this project installed during the last five (5) years of the same scope, complexity and at least 50 percent of the square footage.
  - H. Material Test Reports: For moisture and/or relative humidity of substrate.
  - I. Cleaning and Maintenance Data:
    1. Include procedures for stain removal, stripping, and sealing.
    2. Submit 3 copies of NTMA maintenance recommendations and 3 copies of manufacturer's instructions.
  - J. Mock-Up: As described below.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  1. Manufacturer shall be an associate member of NTMA.
  2. Manufacturer shall be an epoxy manufacturer with at least ten (10) years experience in the manufacturer of epoxy flooring materials.
- B. Installer Qualifications: A qualified installer who is acceptable to Architect and epoxy terrazzo Manufacturer to install Manufacturer's products.
  1. Terrazzo contractor must have at least five (5) years of satisfactory experience in installation of epoxy terrazzo. Terrazzo contractor shall demonstrate experience during last five (5) years of at least five (5) projects of comparable scope and complexity of at least 50 percent of the total square footage of this project.
  2. Terrazzo contractor shall be a contractor member of NTMA for 5 years in good standing.
- C. Source Limitations:
  1. Obtain primary Epoxy Terrazzo Flooring System materials including moisture treatment, membranes, primers, resins and hardening agents from a single manufacturer with proof of NTMA Associate membership.
  2. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
  3. Obtain each color, grade, type, and variety of granular material from single source with resources to provide materials of consistent quality in appearance and physical properties.
- D. NTMA Standards: Comply with NTMA's "Terrazzo Specification and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
- E. Pre-Installation Conference: Conduct conference at Project site. Review methods and procedures related to terrazzo including, but not limited to the following:

1. Inspect and discuss installation procedures, joint details, jobsite conditions, substrate specification, vapor barrier details and coordination with other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
3. Review special terrazzo designs and patterns.
4. Review dust control procedures.
5. Review plans for concrete curing and site drying to enable timely achievement of suitable slab moisture conditions.

**F. Mock-Up**

1. Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
2. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size of mock-up to be not less than 10 by 10 feet.
3. Locate where directed.
4. Mock-up may remain as part of the Work, if approved by Architect, and if undisturbed at time of Substantial Completion.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name and lot number, if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.
  1. Storage temperatures should be between 50 deg. F and 80 deg. F.
- C. Keep products away from fire or open flame.

**107 PROJECT CONDITIONS**

- A. Evaluate slab condition, including slab moisture content and extent of repairs required, if any.
- B. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.
- C. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.
- D. Concrete to receive epoxy terrazzo shall have cured for at least 28 days and be free of all curing compounds (unless moisture vapor primer is incorporated into the system). Test concrete substrate to determine acceptable moisture levels prior to installation. Testing should be conducted according to ASTM F2170 (determining relative humidity in concrete slabs using in situ probes).
- E. Prior to and during each day of installation, the terrazzo contractor shall verify that the dew point is at least 5 deg F. less than the slab and air temperature.
- F. Provide ambient lighting level of 50 ft candles, measured at floor surface.
- G. Acceptable Substrates:
  1. Flatness tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/4" in any 10 feet. Any irregularity of the surface requiring patching and/or leveling shall be done using fill and selected aggregates recommended by resin manufacturer.
  2. Concrete floor shall be prepared mechanically by shot blasting or by grinding with scarifying diamonds recommended by terrazzo matrix manufacturer in accordance with ICRI Guidelines No. 03732. Surface preparation results should achieve a CSP3-CSP5 profile.
  3. Concrete floor shall receive a steel trowel finish.

4. Concrete shall be cured a minimum of 28 days.
5. No curing agents are to be used in areas to receive terrazzo.
6. Concrete slab shall have an efficient moisture vapor barrier (suggested minimum: fiber reinforced 15 mils thickness) directly under the concrete slab. Moisture barrier shall NOT be punctured.
7. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete and at a frequency compatible to ACI recommendations.

**108 FIELD CONDITIONS**

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
  1. Maintain the ambient room and floor temperature at 50°F or above for a period extending 72 hours before, during and after floor installation.
  2. Prior to and during each day of installation, verify that the dew point is at least 5°F less than the slab and air temperature.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.
- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
- F. Provide protection from other trades prior to date of Substantial Completion.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS/PRODUCTS**

- A. Epoxy Matrix Terrazzo:
  1. Quadrant Chemical Companies.
  2. TEC Specialty Construction Brands, Inc., Tuff-Lite Epoxy Terrazzo Systems.
  3. Terrazzo & Marble Supply Companies, Wheeling, IL; Product "Terroxy Resin Systems Epoxy Matrix" [Basis-of-Design]: [www.tmsupply.com](http://www.tmsupply.com).
  4. Substitutions: See Section 01 6000 - Product Requirements.

**202 MATERIALS**

- A. Primer for Slabs above Grade: Terroxy Primer, or approved equal.
- B. Moisture Vapor Treatment for Slabs-On-Grade, Light Weight Concrete and Green Concrete: Terroxy® Moisture Vapor Treatment.
  1. Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH. Moisture Vapor Treatment must suppress a minimum of 91% Relative Humidity.
- C. Flexible Reinforcing Membrane for Substrate Crack Preparation and Reflective Crack Reduction: Terroxy Iso-Crack Epoxy Membrane
  1. Reinforcement: Manufacturer's fiberglass scrim.
- D. Epoxy Matrix: Terroxy Epoxy Matrix, or approved equal, in color required for mix indicated.

1. Physical properties without aggregates. All specimens cured for 7 days at 75°F plus or minus 2°F and 50 percent plus or minus 2 percent RH. This product shall meet the following requirements:

<b>Property</b>	<b>Test Method</b>	<b>Terrazzo Typical Results</b>
Hardness	ASTM D-2240 using Shore-D Durometer	75-85
Tensile Strength	ASTM D-638	3,000 psi min. to 5000 psi max.
Compressive Strength	ASTM D-695 Specimen B cylinder	12,000 psi min. (82.7 MPa)
Flexural Strength	ASTM D-790	4,500 psi min. (31.7 MPa)

Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method	No deleterious effects:
		• Distilled Water
		• Mineral Oil
		• Isopropanol
		• Ethanol
		• 0.025 Detergent Solution
		• 1% Soap Solution
		• 10% Sodium Hydroxide
		• 10% Hydrochloric Acid
		• 30% Sulfuric Acid
		• 5% Acetic Acid

2. Physical properties with aggregates. For Epoxy Matrix blended with three volumes of Valdars marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to Installation Specifications, finishing to a nominal 3/8" (9.5 mm) thickness. All specimens cured for 7 days at 73-77°F and 50 percent RH plus or minus 2 percent RH. This finished Epoxy Matrix shall meet the following requirements:

<b>Property</b>	<b>Test Method</b>	<b>Thin-set Epoxy Terrazzo Typical Results</b>
Flammability	ASTM D-635	Self extinguishing, extent of burning 0.25 inches (6.4 mm) max
Thermal Coefficient of Linear Expansion	ASTM D-696	25x10 <sup>-6</sup> inches per inch per degrees to 140°F 11.4 x 10 <sup>-7</sup> cm per cm per 1C to 601C Max
Bond Strength	ACI COMM 403, Bulletin 59-43 (pages 1139-	300 psi (100% concrete failure)

	1141)	2.1 MPa (100% concrete failure)
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- E. Finishing Grout: Epoxy, color to match terrazzo matrix.
- F. Aggregate: Marble, Glass, Mother of Pearl, Porcelain, or Concrete (as selected) complying with NTMA gradation standards for mix indicated, and containing no deleterious or foreign matter.
  - 1. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
  - 2. 24-hour Absorption Rate: Less than 0.74 percent.
  - 3. Dust Content: Less than 1.0 percent by weight.
- G. Finishing Grout: Terroxy Epoxy Matrix or Terroxy Clear Resin (or approved equals) with a broadcast of limestone filler as recommended by manufacturer.

**203 STRIP MATERIALS**

- A. Divider Strips, Thin-Set: L-type.
  - 1. Material:
    - a. Brass.
  - 2. Guide for commonly used L-type divider strips for Thin-set Epoxy Terrazzo Systems:

System Height	Strip Height	Strip Width
3/8" System	3/8"	16 gauge
		1/8"
		1/4"

- B. Divider Strips: 1/8 inch thick brass exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- C. Control-Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8" - 1/4" width between. (Single L-type angle, positioned adjacent to the joint is also acceptable.) Fill joint with 100% solids epoxy joint filler. Fill area between strips with elastomeric joint filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.
- D. Accessory Strips: Match divider strip width, material and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
  - 1. Edge-bead for exposed edges of terrazzo.
  - 2. Nosings for terrazzo stair treads and landings.
- E. Non-Slip Inserts: Provide channel-shaped inserts filled with a mixture of resin and fine, abrasive aggregate.

**204 MISCELLANEOUS ACCESSORIES**

- A. Strip Adhesive: 100% solids epoxy resin adhesive recommended by epoxy matrix manufacturer.
- B. Anchoring Devices:
  - 1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
  - 2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by terrazzo contractor for proper anchorage and support of units for conditions of installation and support.

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- C. Patching and Fill Material: Terroxy Fill and selected aggregates as recommended by Terroxy Resin Systems, or approved equivalent.
  - D. Joint Compound: Terroxy Joint Filler or approved equivalent, color to be selected by Architect to match/complement terrazzo.
  - E. Cleaner: Neutralizing liquid type, pH of between 7 and 10 specifically designed for terrazzo, and recommended by manufacturer.
  - F. Sealer: Slip and stain-resistant sealer that is chemically neutral with a pH factor between 7 and 10, that meets a standard coefficient of friction of 0.5 or higher, as measured by the James Machine (ASTM D-2047 Test Method), does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide."
    - 1. TRX Water Based 2-K Urethane / Acrylic Coating. 3 coats required.
  - G. Primer: Recommended by terrazzo manufacturer.

**205 BASE**

- A. Terrazzo Cove Base:
  - 1. Precast Epoxy Terrazzo Cove Base: Type flat, 6 inches high.

**206 PRECAST TERRAZZO**

- A. Precast Terrazzo Units: Precast epoxy terrazzo -base/curb, stair tread, stair riser, and threshold.
  - 1. Manufacturers: Subject to compliance with requirements, provide products acceptable to architect.
    - a. Precast Terrazzo Enterprises (Basis of Design)
    - b. Rocomo Precast
    - c. WAUSAU
- B. Precast Terrazzo Base Units: 3/8" thick, cast in maximum lengths possible, but not less than 36".
  - 1. Type: Flat.
  - 2. Height and profile: As indicated in drawings.
  - 3. Outside Corner Units: With finished returned edges at outside corner.
  - 4. Color and Pattern: Match adjacent poured-in-place terrazzo flooring.
- C. Precast Terrazzo Stair Treads: Thickness indicated, with cast-in nosing.
  - 1. Ono Piece Tread/Riser: 1" thick epoxy, Shape as size as indicated on drawings.
  - 2. Color and Pattern: As indicated on drawings.

**207 TERRAZZO MIX**

- A. Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's product data for matrix and aggregate proportions and mixing.
  - 1. Color and Pattern Schedule: Where the following designations are indicated, provide specified terrazzo matrices matching architect's samples:
    - a. TZF-1A: Custom TBD [Field].
    - b. TZF-1B: Custom TBD [Accent].

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Examine substrates and areas for compliance with requirements for installation tolerances and other conditions affecting performance.



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- B. Acceptable Substrates:
1. Level Tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/4" in any 10 feet (6.4 mm in 3.1m). Irregularities of the surface requiring patching and/or leveling shall be done using Terroxy® Fill and selected aggregates as recommended by Terroxy® Resin Systems (or approved equivalents).
  2. Concrete floor shall have a steel trowel finish.
  3. Concrete shall have been cured a minimum of 28 days. No curing agents shall have been used in areas to receive terrazzo.
  4. Concrete slab shall have an efficient moisture vapor barrier (minimum 15 mils (.4 mm thickness)) directly under the concrete slab. Moisture barrier shall not be punctured.
  5. Saw cutting of control joints shall have been done between 12 and 24 hours after placement of the structural concrete and at a frequency compatible with ACI recommendations.
- C. Proceed with installation only after unsatisfactory conditions, including level tolerances, have been corrected.

### **302 PREPARATION**

- A. Clean substrates of substances, including oil, grease and curing compounds, that might impair terrazzo bond. Provide clean, dry and neutral substrate for terrazzo application.
- B. Concrete Slabs:
1. Provide sound concrete surface free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil and other contaminants incompatible with terrazzo.
    - a. Prepare concrete mechanically by shot blasting. Surface preparation results should achieve a CSP3-CSP5 profile according to International Concrete Repair Institute Guideline No. 03732.
    - b. The General Contractor shall be responsible for correcting non-conforming concrete substrates using materials compatible with epoxy terrazzo flooring system and as approved by the Terrazzo Contractor.
      - 1) Materials used to correct nonconforming conditions must be compatible with the selected epoxy system and be approved by the manufacturer of epoxy resin materials and Terrazzo Contractor.
    - c. Repair cracks and non-expansion joints greater than 1/16" (1.6 mm) wide according to Terroxy® Resin Systems Technical Bulletin 009 Crack Detailing and Joint Treatments for Terroxy® Resin Thin-set Epoxy Terrazzo (or approved equivalents).
    - d. Protect other work from dust generated by shot blasting operations. Control dust to prevent air pollution and comply with environmental protection regulations.
    - e. Erect and maintain temporary enclosures and other suitable methods to prevent dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.
- C. Verify that concrete substrates are visibly dry and free of moisture. Document the moisture level of concrete slab-on-grade surfaces prior to installation of terrazzo. Test moisture level with accord with ASTM F2170 (determining relative humidity in concrete slabs using in situ probes).
- D. Primer application:
1. At Slabs-On-Grade, Light Weight Concrete and Green Concrete: Apply moisture vapor treatment in accord with Moisture Vapor Treatment Product Data Sheet.
  2. At Slabs Above Grade: Apply primer in accord with manufacturer's product data.

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- E.
    - 1. Verify that concrete substrates are visibly dry and free of moisture.
      - a. Moisture Testing:
        - 1) Test for moisture according to ASTM F2170 (determining relative humidity in concrete slabs using in situ probes).
        - 2) Proceed with installation only after substrates have a maximum relative humidity measurement reading less than 80%. If relative humidity measurement reading is greater than or equal to 80%, Moisture Vapor Primer is recommended. Apply to terrazzo substrates according to Resin Systems Moisture Vapor Primer Product Data Sheet.
  - F. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.
    - 1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.
  - G. Clean substrate of foreign matter.
  - H. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions.
  - I. Apply primer in accordance with manufacturer's instructions.

### **303 EPOXY TERRAZZO INSTALLATION**

- A. General:
  - 1. Comply with NTMA's written recommendations for terrazzo and accessory installation.
  - 2. Place, rough grind, grout, cure grout, fine grind and finish terrazzo according to Terroxy® Resin Systems Epoxy Matrix Product Data Sheet and NTMA's "Terrazzo Specifications and Design Guide."
  - 3. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
  - 4. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- B. Thickness: 3/8" (9.5 mm)
- C. Flexible Reinforcing Membrane:
  - 1. Membrane Application for Isolated Cracking: Route out all cracks and fill with 100% solids epoxy. Apply Flexible Reinforcing Membrane (spread at 40 mils thickness) across the crack allowing a minimum of 9 inches on either side. Embed fiberglass scrim on top wet membrane. Allow for 10% of total terrazzo square footage in lineal feet of crack detailing. Ex) 10,000 SF allow for 1,000 LF of crack detailing. 1LF of crack detailing shall allow for 1.5 SF of Iso-Crack Epoxy Membrane.
- D. Divider and Accessory Strip installation:
  - 1. Install strips in adhesive setting bed without voids below strips to substrate.
  - 2. Control-Joint Strips, Construction Joints, Isolation Joints shall be installed in accordance with NTMA TB-24.
- E. At terminations and doorways, saw cut concrete and chisel out to provide proper termination of flooring material; no feathered edges allowed.
- F. Placing Terrazzo:

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1. Mix epoxy matrix with chips and fillers in ratios directed by Terroxy® Resin Systems product data.
  2. Trowel apply terrazzo mixture over epoxy primer to provide a dense flat surface to top of divider strips. Allow to cure in accord with Terroxy® Resin Systems product data before rough grinding.
- G. Rough Grinding: Grind with 24 grit silicon carbide or 24 grit turbo diamonds until all terrazzo strips and marble chips are uniformly exposed.
- H. Grouting:
1. Cleanse floor with clean water and rinse.
  2. Remove excess rinse water by wet vacuum, dry and fill voids with Terroxy® Resin Systems Epoxy Matrix or Clear Resin with a broadcast of limestone filler.
  3. Allow grout to cure. Grout may be left on terrazzo until other trades work is completed.
- I. Polishing: Polish to 200 grit T&M Resin Pads or equivalent stones until all grout is removed from surface. Repeat rough grinding, grout coat and polishing if large terrazzo chip voids exist after initial polishing. Produce surface with a minimum of 70 percent aggregate exposure.
- J. Completed flooring shall be uniform in color, texture and aggregate distribution. Surface shall be in place and uniform and free of bubbles, foreign material, defect or irregularity. Trim edges and where material abuts adjacent construction. Edges at doors shall occur under closed door.

**304 PRECAST TERRAZZO INSTALLATION**

- A. Install precast units using method recommended by NTMA and manufacturer unless otherwise indicated.
- B. Seal joints between units with joint sealants.

**305 TOLERANCES**

- A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

**306 CLEANING AND PROTECTION**

- A. Cleaning: Remove grinding dust from installation and wash all surfaces with Terroxy® Terra Clean.
- B. Sealing: Apply TRX Water Based 2-K Urethane / Acrylic Coating. Slip, stain and scuff-resistant sealer that is chemically neutral with a pH factor between 7 and 10, that meets a standard coefficient of friction of 0.5 or higher, as measured by the James Machine (ASTM D-2047 Test Method), does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide."
- C. Protection: Upon completion, the work shall be ready for final inspection and acceptance by the owner or his agent. Provide final protection and maintain conditions, in a manner acceptable to terrazzo contractor, that ensure terrazzo is without damage or deterioration.

**END OF SECTION**

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**SECTION 09 6723.02  
DECORATIVE FLAKE RESINOUS FLOORING**

**PART 1 GENERAL**

**101 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**102 SUMMARY**

- A. This Section includes one resinous flooring system, one with epoxy body.
  - 1. Application Method: Squeegee, screed, and broadcast.

**103 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Verification: For each resinous flooring system required, 5 inches (150 mm) square, applied to a rigid backing.
- C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Maintenance Data: For resinous flooring to include in maintenance manuals.

**104 QUALITY ASSURANCE**

- A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy based flake broadcast with mortar coat). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.
- B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
  - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
  - 2. Contractor shall have completed at least 10 projects of similar size and complexity.
- C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
  - 1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

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- E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
    - 1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
      - a. Include 48-inch (1200-mm) length of integral cove base.
    - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  - F. Pre-installation Conference:
    - 1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
    - 2. Attendance:
      - a. General Contractor
      - b. Architect/Owner's Representative.
      - c. Manufacturer/Installer's Representative.

**105 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

**106 PROJECT CONDITIONS**

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
  - 1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- D. Concrete substrate shall be properly cured. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

**107 WARRANTY**

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

**PART 2 PRODUCTS**

**201 RESINOUS FLOORING**

- A. Available Products: Subject to compliance with requirements.

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1. Confirm inclusion of 25mil body coat, and broadcast quartz into primer increasing bond strength. Products that may be incorporated into the work include,
  - B. Products: Subject to compliance with requirements:
    1. Stonhard, Inc.; Stontec ERF®. Basis of Design.
    2. Tnemec
    3. Substitutions: Reference Section 01 6000
  - C. System Characteristics:
    1. Color and Pattern: Select from manufactures standards
    2. Wearing Surface: Standard
    3. Integral Cove Base: 6"
    4. Overall System Thickness: 2mm
  - D. System Components: Manufacturer's standard components that are compatible with each other and as follows:
    1. Primer:
      - a. Material Basis: Stonhard Standard Primer
      - b. Resin: Epoxy
      - c. Formulation Description: (2) two component 100 percent solids.
      - d. Application Method: Squeegee and roller.
      - e. Number of Coats: (1) one.
      - f. Aggregates: Broadcast quartz into wet primer coat.
    2. Body Coat(s):
      - a. Material Basis: Stonshield Undercoat.
      - b. Resin: Epoxy.
      - c. Formulation Description: (3) three component solvent free epoxy.
      - d. Application Method: Notched squeegee.
        - 1) Thickness of Coats: 25-30 mils with standard primer coat
        - 2) Number of Coats: (1) One.
    3. Broadcast:
      - a. Material Basis: Stontec Flakes
      - b. Formulation Description: Decorative flake (1/16")
      - c. Type: Tweed (chips to be mixed in Mfg. facility)
      - d. Finish: Broadcast to rejection.
      - e. Number of Coats: one.
      - f. Color: See Finish Legend
    4. Topcoat:
      - a. Material Basis: Stonkote CE4
      - b. Resin: Epoxy.
      - c. Formulation Description: (2) component, UV stable, solvent free epoxy.
      - d. Type: Clear.
      - e. Finish: Gloss
      - f. Number of Coats: Two.
  - E. System Physical Properties
    1. Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
    2. Tensile Strength: 5,200 psi per ASTM D-638
    3. Flexural Strength: 4,000 psi per ASTM D-790
    4. Flexural Modulus of Elasticity:  $1.7 \times 10^6$  psi per ASTM D-790
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5. Hardness: .85 to .90 per ASTM D-2240, Shore D
  6. Linear Coefficient of Thermal Expansion:  $17 \times 10^{-6}$  in./in. °F per ASTM C-531
  7. Impact Resistance: Exceeds 160 in.-lbs. per ASTM D-4060, CS-17
  8. Abrasion Resistance: 0.03 gm max. weight loss per ASTM D-4060, CS-17
  9. Flammability: Class I per ASTM E-648

### **PART 3 EXECUTION**

#### **301 PREPARATION**

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
  1. Mechanically prepare substrates as follows:
    - a. Mechanically prepare with the use of Diamond grinding equipment to provide surface sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring. Or,
    - b. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup or Diamond Grind with a dust free system.
    - c. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
  2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
  3. Verify that concrete substrates meet the following requirements.
    - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 80 percent.
    - b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab in 24 hours.
- C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material.

#### **302 APPLICATION**

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
  1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

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- a. Apply joint sealant to comply with manufacturer's written recommendations.
  - B. Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates
  - C. Broadcast: Immediately broadcast quartz silica aggregate into the primer using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
  - D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners. Refer to detail drawings.
  - E. Body coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.
  - F. Broadcast: Immediately broadcast decorative flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
  - G. First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.
  - H. Second sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

**3.03 TERMINATIONS**

- A. Chase edges to "lock" the coating system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Trenches: Continue coating system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- D. Treat floor drains by chasing the coating to lock in place at point of termination.

**3.04 JOINTS AND CRACKS**

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

**3.05 FIELD QUALITY CONTROL**

- A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
  - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.



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3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

**3.06 CLEANING, PROTECTING, AND CURING**

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General Contractor is responsible for cleaning prior to inspection.

**END OF SECTION**

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**SECTION 09 6813  
TILE CARPETING**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Carpet tile, fully adhered.

**1.02 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 09 3000 - Tiling: Termination edging of adjacent floor finish.
- C. Section 09 6500 - Resilient Flooring: Rubber base, and transition strips.

**1.03 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate layout of joints.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Submit two, 12 inch long samples of edge strip, base cap, and stair nosing.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

**1.05 FIELD CONDITIONS**

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. See Drawings for Manufacturer.
- B. Substitutions: See Section 01 6000 - Product Requirements.

**2.02 MATERIALS**

- A. Tile Carpeting: Fusion bonded, unless indicated otherwise; manufactured in one color dye lot.
  - 1. Tile Size: As indicated on Finish Legend.

2. Pile Height: 1/2 inch maximum.
3. Color: As indicated on Finish Legend.
4. Pattern: As indicated on Finish Legend.

**203 ACCESSORIES**

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Embossed aluminum, or rubber, as selected; color as selected.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer, compatible with materials being adhered.
- D. Carpet Tile Adhesive: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by carpet tile manufacturer and adhesive materials manufacturer.

**302 PREPARATION**

- A. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

**303 INSTALLATION**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Locate change of color or pattern between rooms under door centerline.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.
- I. Fasten exposed edges of carpet to floor surface with trim at entire length of exposed edge.

**304 CLEANING**

- A. Clean and vacuum carpet surfaces.

**END OF SECTION**

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**SECTION 09 8430**  
**SOUND-ABSORBING WALL AND CEILING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sound-absorbing panels.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 9123 - Interior Painting.

**1.03 REFERENCE STANDARDS**

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2023.

**1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.
- D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.
- E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
- F. Manufacturer's qualification statement.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

**PART 2 PRODUCTS**

**2.01 FABRIC-COVERED SOUND-ABSORBING UNITS**

- A. Manufacturers:
  - 1. Conwed Designscape/Wall Technology; Basis of Design: [www.conweddesignscape.com/#sle](http://www.conweddesignscape.com/#sle).
  - 2. Kinetics Noise Control, Inc; \_\_\_\_\_: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.

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- B. General:
    - 1. Prefinished, factory assembled fabric-covered panels.
    - 2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
  - C. Fabric-Covered Acoustical Panels for Walls:
    - 1. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
    - 2. Sound Absorption: Noise Reduction Coefficient (NRC) or Sound Absorption Average (SAA) of \_\_\_\_\_ when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
    - 3. Panel Size: \_\_\_\_\_ inches by \_\_\_\_\_ inches. As indicated on the drawings
    - 4. Panel Thickness: 2 inches.
    - 5. Edges: Perimeter edges reinforced by a formulated resin hardener.
    - 6. Fabric: Woven polyester.
    - 7. Color: As selected by Architect from manufacturer's full range.
    - 8. Color: As indicated on Finish Legend

## **202 FABRICATION**

- A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
  - 1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.
  - 2. For panels suspended from ceiling, provide fabric covering both sides, with seams only at panel edges.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

## **203 ACCESSORIES**

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
  - 1. Z-clip hanger and magnet system with magnets recessed into panel frame and designed to engage steel mounting plates secured to substrate with screws.
- B. Fixing Clips: Manufacturers standard for application as indicated.

## **PART 3 EXECUTION**

### **301 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

### **302 INSTALLATION**

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with shop drawings.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

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**303 CLEANING**

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

**304 PROTECTION**

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

**END OF SECTION**

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**SECTION 09 9100  
PAINTING**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
  - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
  - 2. Exposed surfaces of steel lintels and ledge angles.
  - 3. Mechanical and Electrical:
    - a. In all areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    - b. In all areas, paint shop-primed items.
    - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    - d. Paint dampers exposed behind louvers, grilles, to match face panels.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 5. Non-metallic roofing and flashing.
  - 6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
  - 7. Marble, granite, slate, and other natural stones.
  - 8. Floors, unless specifically so indicated.
  - 9. Ceramic and other tiles.
  - 10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
  - 11. Brick, and cast stone.
  - 12. Glass.
  - 13. Acoustical materials, unless specifically so indicated.
  - 14. Concealed pipes, ducts, and conduits.
  - 15. Door hinges, hardware, or fire door labels.
  - 16. Rusty or corroded surfaces until sandblasted or wire-brushed free of corrosion, and wiped clean.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3931 - Curing, Sealing, and Hardening Concrete Floors: Floor sealer, hardener, and densifier.
- C. Section 05 5000 - Metal Fabrications: Shop-primed items.



- D. Section 08 1113 - Steel Doors and Frames: Shop-primed steel doors and frames.
- E. Section 09 2116 - Gypsum Board Assemblies.

**103 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2012.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

**104 DEFINITIONS**

- A. Conform to ASTM D 16 for interpretation of terms used in this section.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products and special coatings, including VOC content.
  - 1. List each material and cross reference to scheduled paint types, and including each specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
- C. Samples for initial color selection in the form of manufacturer's color charts from paint/coating manufacturer intended for use.
- D. Samples: Submit two paper chip samples, 4x8 inch in size illustrating range of colors available for each surface finishing product scheduled.
- E. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- G. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- H. Applicator certifications that are required to be in writing.
- I. Submit Manufacture Representative reports as outlined in Field Quality Control below.
- J. Coating Maintenance Manual: Upon conclusion of the Project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as S-W "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product / color / finish was used, product data pages, Material Safety Data Sheet (MSDS), care and cleaning instructions, and Touch-up procedures.

**106 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

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- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.
  - C. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by paint manufacturer, and use only within the recommended limits.
  - D. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
    - 1. Notify the Architect of any problems anticipated using the materials specified, prior to proceeding with work.
  - E. Material Quality: Provide the manufacturer's best quality grade paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
    - 1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude approved equivalent products of other manufacturers.
  - F. Mock-Up: Provide mock-up at least 3 ft x 3 ft of general wall paint and trim for Architect's and Owner's review. Mock-Up guidelines as described in Section 01 4000 - Quality Requirements.
  - G. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
  - H. Lead content in pigments or other painting materials and components is not allowed.

**107 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

**108 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, pigment and vehicle constituents by volume, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers, others present or passing through or inspecting work areas (painting or any other work), and the work areas themselves are protected from fire and health hazards resulting from handling, mixing, and application of materials.

**109 PROJECT CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer, during application, drying and curing periods.

- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for solvent-thinned Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

**110 EXTRA MATERIALS**

- A. See Section 01 6000 - Product Requirements, for additional provisions.
- B. Supply 1 gallon of each color and type; store where directed.
- C. Label each container with color, type, and room locations in addition to the manufacturer's label.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- B. Paints:
  - 1. Sherwin-Williams [Basis of Design]: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  - 2. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com).
  - 3. PPG Architectural Finishes, Inc: [www.ppgaf.com](http://www.ppgaf.com).
- C. Block Fillers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 - Product Requirements.

**202 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
  - 4. Supply each coating material in quantity required to complete entire project's work from a single production run.
  - 5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of State in which the project is located.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

- D. Colors: As indicated on drawings
  1. In all areas, finish pipes, ducts, conduit, and equipment the colors as indicated on drawings. Refer to Finish Legend.

### **203 PAINT SYSTEMS - EXTERIOR**

- A. Concrete, Poured and Precast:
  1. One Coat: S-W: Loxon Concrete & Masonry Primer, A24W8300, (<100 g/l voc).
  2. Two Coats: S-W: SuperPaint Acrylic Exterior House Paint (Flat, A80-100 series) (Satin, A89-100 Series) (Gloss, A84-100 Series) - Architect to select finish required (<50 g/l voc).
- B. Masonry, Opaque, (One filler coat and two acrylic finish coats):
  1. One Coat: S-W: PrepRite Interior / Exterior Acrylic Block Filler, B25W25 (<50 g/l voc) (as required to be pinhole-free).
  2. Two Coats: S-W: SuperPaint Exterior Acrylic House Paint, Gloss, A84-100 Series (<50 g/l voc).
- C. Fiber Cement Board, Acrylic Primer and Paint, 3 Coat:
  1. One Coat: S-W: Loxon Latex Primer, A24 (if unprimed).
  2. Two Coats: S-W: A100 Exterior Acrylic House Paint, A82. More coats if needed to cover all fibering. Sheen: As selected from gloss or satin.
- D. Gypsum Board Soffit (Glass-mat faced), Acrylic Primer and Paint, 3 Coat:
  1. One Coat: S-W: Multi-Surface Interior/Exterior Acrylic Primer Sealer, B51W450.
  2. Two Coats: S-W: SuperPaint Acrylic Exterior House Paint (Flat, A80-100series) (Satin, A89-100 Series) (Gloss, A84-100 Series) - Architect to select finish required (<50g/l voc).
- E. Ferrous Metals, Unprimed, 100% Acrylic, 3 Coat:
  1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 (<100 g/l voc).
  2. Two Coats: S-W: Sher-Cryl High Performance Acrylic, Gloss, B66-300 (<200 g/l voc).
- F. Ferrous Metals, Primed, Acrylic Latex, 2 Coat:
  1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
  2. Two Coats: S-W: Sher-Cryl High Performance Acrylic, Gloss, B66-100 (<200 g/l voc).
- G. Galvanized Metals, Acrylic, Opaque, 3 Coat:
  1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Metal Primer, B66-300 (<100 g/l voc).
  2. Two Coats: S-W: Sher-Cryl High Performance Semi-Gloss, B66-350 (<200 g/l voc).

### **204 PAINT SYSTEMS - INTERIOR**

- A. Concrete, Poured and Precast, Opaque, Acrylic, 3 coats.
  1. One Coat: S-W: Loxon Concrete & Masonry Primer, A24W8300 (<100 g/l voc).
  2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).
- B. Concrete, Epoxy 3 Coat System, (Pre-Catalyzed Water Based), (for Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place including Plaster Walls and Ceilings. Inside Face of Single-Wythe Exterior Concrete Block Walls; Rest Rooms, Laundry Rooms and other Wet Areas):
  1. One coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).

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2. Semi-Gloss: Two coats of S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series. (4 mils wet, 1.5 mils dry per coat).
  - C. Concrete - Smooth, Epoxy 2 Coat System, (Water Based Catalyzed), (for Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place, Toilets and other Wet Areas):
    1. Gloss: Two coats: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat). -or-
    2. Eg-Shel: Two coats: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
  - D. Masonry, Opaque, Latex, 3 Coat:
    1. One Coat: S-W: Pro Industrial Heavy Duty Block Filler, B42W150. (Required to be pin-hole free).
    2. Two Coats: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).
  - E. Masonry, Epoxy System, (Pre-Catalyzed Water Based), 3 Coat, (CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted, Stucco). Location: Inside Face of Single-Wythe Exterior Concrete Block Walls, and in Rest Rooms, Laundry Rooms, and other Wet Areas):
    1. One coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils dry).
    2. Semi-Gloss/High Luster Finish: Two coats: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series (4 mils wet, 1.5 mils dry per coat).
  - F. Ferrous Metals, Unprimed, Acrylic, 3 Coat:
    1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-310 (<100 g/l voc).
    2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).
  - G. Ferrous Metals, Acrylic Primed, Acrylic-Alkyd Finish, 2 Coat:
    1. One Coat: Touch up with primer: S-W: Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-310 (<100 g/l voc).
    2. Two Coats: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200 Series.
  - H. Galvanized Metals, Acrylic, 3 Coat:
    1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Primer, B66-310 (<100 g/l voc).
    2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).
  - I. Gypsum Board/Plaster, Latex-Acrylic, 3 Coat (for Offices, etc.):
    1. One Coat: S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (0 g/l voc).
    2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20-2600 (0 g/l voc).  
(Where Sheen is indicated "Gloss", provide Pro Industrial™ High Performance Acrylic, B66-600 Series, <50 g/l voc).
  - J. Gypsum Board, Polyurethane/Acrylic Pattern, 3 Coat (where noted):
    1. One Coat: Primemaster Primer/Sealer, or primer recommended by manufacturer.
    2. One Coat: Water-based polyurethane/acrylic base coat: "Scuffmaster MC100" by Master Coating Technologies: [www.scuffmaster.com](http://www.scuffmaster.com)
    3. One Coat: Water-based polyurethane/acrylic metallic pattern coat. "Scuffmaster AC1200M" by Master Coating Technologies: [www.scuffmaster.com](http://www.scuffmaster.com)
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4. Miscellaneous Materials: Surface patching compounds and other materials necessary for application of finish system shall be of high quality and compatible with coating system.
- K. Gypsum Board, Epoxy 3 Coat System, (Pre-Catalyzed Water-Based), (for Toilets, Laundry Rooms, Weight Rooms, etc.):
1. One coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
  2. Semi-gloss: Two coats of S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss, K46- Series. (4 mils wet, 1.5 mils dry per coat). -or-
  3. Eg-Shel: Two coats of S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K46-Series. (4 mils wet, 1.5 mils dry per coat).
- L. Gypsum Board, Epoxy 3 Coat System, (Water Based Catalyzed), (for Kitchens, Rest Rooms, Wet Areas, etc.):
1. One coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry).
  2. Gloss Finish: Two coats of S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat). -or-
  3. Eg-Shel Finish: Two coats of S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
- M. Wood, Opaque, Acrylic Latex, 3 Coat:
1. One Coat: S-W: Multi-Purpose Interior / Exterior Latex Primer /Sealer, B51-450 Series (<50 g/l voc).
  2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel Enamel, B20-2600 (0 g/l voc).
- N. Wood, Transparent, Varnish, Stain:
1. Filler coat: S-W: As required.
  2. One coat of stain; S-W: WoodClassics "250" Interior Wood Stain, A49-800 Series (<250 g/l voc). Option: S-W: MinWax "250" VOC Stain (<250 g/l voc).
  3. Two coats; S-W: WoodClassics Waterbased Polyurethane, A68 Series (<350 g/l voc). Option: MinWax Waterbased Polyurethane Varnish: Satin (710337), Semi-Gloss (710320), Gloss (710313) (<350 g/l voc).

## **205 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 - EXECUTION**

### **301 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

E. All surfaces to be pinhole free.

### **302 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- M. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- N. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

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**303 APPLICATION**

- A. Identify fire walls, smoke barriers, etc., in accessible concealed floor, floor-ceiling or attic spaces, by stenciling "X-HOUR FIRE AND/OR SMOKE BARRIER" in 3-inch high contrasting letters, 3/8-inch minimum stroke. Locate within 15 feet of end of wall, and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Apply products in accordance with manufacturer's instructions.
- D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- F. Apply each coat to uniform appearance.
- G. All surfaces shall be pinhole-free.
- H. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- I. Sand wood and metal surfaces lightly between coats to achieve required finish.
- J. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- K. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- L. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**304 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Refer to Division 23 and 26 Sections for scheduling of color coding of equipment, duct work, piping, and conduit.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**305 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Architect shall approve surface prior to finish coats being applied.
- C. Manufacturers Representative shall visit the site a minimum of 3 times. These visits shall be at the beginning, middle and completion of work.
  - 1. The beginning visit shall review the substrate for compliance prior to installation and for appropriate use of products.
  - 2. The middle visit shall review the progress and performance of the installer.
  - 3. The final visit shall review the quality of the final product.
  - 4. The manufacturer shall submit reports to the Contractor and the Architect within 72 hours of each visit. The letter shall document observations, instructions to Contractor, and any remediations required and/or completed.



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**306 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean paint from all electrical devices, mechanical devices, door hardware, architectural items, and other permanent materials.

**307 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

**308 SCHEDULE - SURFACES TO BE FINISHED**

- A. Paint the surfaces described in PART 2, Paint Systems Articles.

**309 SCHEDULE - PAINT SYSTEMS**

- A. Concrete, Poured and Precast: Finish all surfaces exposed to view, unless indicated otherwise.
  - 1. Exterior: Acrylic house paint, 3-coat, Finish - As selected, or scheduled.
  - 2. Interior: Acrylic latex enamel, 3-coat, Semi-gloss.
  - 3. Interior: Epoxy (Pre-Catalyzed), 3-coat, Semi-gloss.
  - 4. Interior: Epoxy (Water-based Catalyzed), 2-coat, Finish - As selected or scheduled.
  - 5. Interior: Epoxy (Solvent-based), 2-coat, Gloss.
- B. Masonry (Concrete Block): Finish all surfaces exposed to view.
  - 1. Exterior: Acrylic, Block filler & House paint, 3-coat, Gloss.
  - 2. Interior: Latex, Block filler & Enamel, 3-coat, Finish - As selected or scheduled.
  - 3. Interior: Epoxy (Pre-Catalyzed), 3-coat, Semi-gloss.
  - 4. Interior: Epoxy (Water-based Catalyzed), Finish - As selected or scheduled.
  - 5. Interior: Epoxy (Solvent-based), 3-coat, Gloss.
- C. Steel Doors and Frames: Finish all surfaces exposed to view.
  - 1. Exterior: Acrylic, Primer & 2-coat, Gloss or Semi-gloss.
  - 2. Interior: Acrylic, Primer & 2-coat, Semi-gloss.
- D. Steel Fabrications: Finish all surfaces exposed to view.
  - 1. Exterior: Acrylic, Primer & 2-coat, Gloss or Semi-gloss, as selected; finish all surfaces, including concealed surfaces, before installation.
  - 2. Interior: Acrylic, Primer & 2-coat, Semi-gloss.
- E. Galvanized Steel: Finish all surfaces exposed to view.
  - 1. Exterior: Acrylic, Primer & 2-coat, Semi-gloss.
  - 2. Interior: Acrylic, Primer & 2-coat Enamel, Semi-gloss.
- F. Gypsum Board: Finish all surfaces exposed to view.
  - 1. Exterior: Glass mat faced soffit: Acrylic, 3-coat, Finish - As selected or scheduled.
  - 2. Interior Ceilings and Walls: Latex Acrylic, 3-coat, Eggshell (Except gloss, where indicated).
  - 3. Interior Walls and Gyp Bd Ceilings in Wet Areas: Epoxy (Pre-Catalyzed) , 3-coat, Finish - As selected or scheduled.
  - 4. Interior Walls and Gyp Bd Ceilings in Wet Areas: Epoxy (Water-based Catalyzed), 3-coat, Finish - As selected or scheduled.
  - 5. Interior Walls and Gyp Bd Ceilings in Wet Areas: Epoxy (Solvent-based), 3-coat, Gloss.
- G. Fiber Cement Board: Acrylic, 3-coat, Finish - As selected or scheduled (Gloss or Satin).

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- H. Wood: Finish all surfaces exposed to view.
1. Exterior: Semi-Transparent Stain, 2-coats.
  2. Interior trim and frames: Opaque, Acrylic Latex Enamel, 3-coat, Eggshell.
  3. Interior trim: Transparent, Polyurethane Varnish Stain, 3-coat, Finish - As selected or scheduled.

**END OF SECTION**

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**SECTION 09 9600  
HIGH PERFORMANCE COATINGS**

**PART 1 – GENERAL**

**101 SUMMARY**

- A. This Section includes applying special coating systems to exposed exterior steel structure as scheduled and/ or indicated.
- B. Scope of this Section including surface preparation, prime coats (including shop applied primer), and topcoats for interior and exterior coatings.
- C. Types of Special Coatings for interior and exterior use as indicated on the drawings and schedules include the following:
  - 1. Organic Zinc Rich Urethane: High Performance, Immersion grade, moisture cured urethane zinc rich primer.
  - 2. Epoxy: Two-component, high performance, polyamide epoxy or polyamine epoxy coating.
  - 3. Fluoropolymer Urethane: Two-component, high performance, thermoset solution fluoropolymer coating.

**102 RELATED DOCUMENTS**

- A. Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, Sections in Division 1 of these Specifications.
- B. Section 05 1200 - Structural Steel Framing: Steel framing to receive high performance coating.
- C. Section 09 9100 - Painting: General painting.

**103 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM B 117 Standard Test Method for Corrosion Resistance.
  - 2. ASTM D 2240 Standard Test Method for Measuring Shore Hardness.
  - 3. ASTM D 2794 Standard Test Method for Measuring Direct Impact.
  - 4. ASTM D 3359 Standard Test Methods for Measuring Adhesion by Tape Test.
  - 5. ASTM D 3363 Standard Test Method for Film Hardness by Pencil Test.
  - 6. ASTM D 4060 Standard Test Method for Abrasion Resistance.
  - 7. ASTM D 4213 Standard Test Method for Measuring Scrub-ability of Coatings.
  - 8. ASTM D 4258 Standard Practice for Surface Cleaning Concrete for Coating.
  - 9. ASTM D 4259 Standard Practice for Abrading Concrete.
  - 10. ASTM D 4261 Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating.
  - 11. ASTM D 4263 Standard Test Method for Indicating Moisture by the Plastic Sheet Method.
  - 12. ASTM D 4541 Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
  - 13. And various other ASTM test standards.
- B. Steel Structures Painting Council (SSPC):
  - 1. Steel Structures Painting Council Surface Preparation Specifications (SSPC-SP)
  - 2. Steel Structures Painting Council Paint Application Specifications (SSPC-PA)

**104 DEFINITIONS**

- A. Definitions as used in Finish Schedule shown on Drawings and Coating Schedule included herein.
  - 1. Coatings: Paint or heavy duty finishes for use on surfaces subject to interior and exterior exposure, submergence, high moisture, splash, or chemical environment, including

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- primers, sealers, fillers, and intermediate and finish coats.
  - 2. Normal: Surfaces subject to normal temperature and humidity.
  - 3. First Coat: Field primer, factory primer, or shop primer. When only one coat is required, first coat is the finish coat.
  - 4. Second, Third, Intermediate, or Finish coats: Successive finish coats applied over first coat.
  - 5. DFT: Dry Film Thickness (Mils/coat).
  - 6. Sfgp: Square feet per gallon (per coat).

**1.05 SUBMITTALS**

- A. Product Data:
  - 1. Manufacturer's product data sheets, product performance criteria, generic chemistry of each coating, and application recommendations for each coating scheduled.
  - 2. List each material and cross-reference the specific coating, finish system, and application.
- B. Submit one copy of manufacturer's Material Safety Data Sheets (MSDS) for each type of coating to Architect for information. Contractor shall post a copy of MSDS on the Site at all times when coating is in progress.

**1.06 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. All coatings shall conform to OSHA requirements for allowable exposure to lead and other hazardous substances.
- B. Product Manufacturer:
  - 1. Manufacturer shall be a company that specializes in producing high quality industrial coating materials. This company shall have 10 years or more experience demonstrated by case histories in the designated field of application.
- C. Applicator Qualifications:
  - 1. Engage an experienced applicator with 5 years or more experience who has successfully completed coating system applications similar in material and extent to those indicated.
- D. Single-Source Responsibility:
  - 1. Provide coating material produced by the same manufacturer for each system.
- E. Performance Testing:
  - 1. The Owner/ Architect will require that any request for substitution will be accompanied by the performance requirements listed in Section 3.07.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Materials shall be delivered to the site in original containers with labels intact and seals unbroken.
- B. Protect and heat or cool material storage location to maintain temperature ranges recommended by coating manufacturers, but not less than 50 degrees F.
- C. Oily rags and waste must be removed from buildings each night or kept in appropriate metal containers. Provide fire extinguishers of the type recommended by coating manufacturers in areas of storage and where finishing is occurring. Allow no smoking or open containers of solvent.
- D. Empty containers shall have labels canceled and clearly marked as to use.

**1.08 PROJECT / SITE CONDITIONS**

- A. Environmental Requirements:

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1. Use indirect-fired dry heat and ventilate areas to obtain conditions recommended by coating manufacturer.
  2. Relative humidity conditions as specified by coating manufacturer shall be adhered to.
  3. No unprotected, unheated exterior coating shall be undertaken when cold damp, foggy, or rainy weather appears probable, nor when the temperature of the substrate is below 50 degrees F, unless listed in this specification or approved in writing by the coating manufacturer.
  4. Maintain the manufacturer's environmental requirements until the coating is fully cured.
  5. Apply no coating in areas where dust is being generated.
  6. Testing and disposal of any waste and coating shall be the responsibility of the CONTRACTOR.
- B. Protection:
1. Drop cloths shall be provided in all areas where coating is performed to fully protect other surfaces.
  2. Remove hardware, accessories, plates, lighting fixtures, and similar items or provide protection by masking. Upon completion, replace items or remove protection and clean.
- C. Upon Substantial Completion, remaining unused material will become property of the OWNER. Seal material as required for storage, mark contents with color, type, location, and shelf life, and store on Site where required by the OWNER. Provide a minimum of two gallons of each system component and color used.

## **PART 2 – PRODUCTS**

### **201 MANUFACTURERS**

- A. Basis of Design: Tnemec Company, Inc.
- B. Other Acceptable Manufacturers:
1. PPG Paints: [www.ppgpaints.com](http://www.ppgpaints.com).
  2. Sherwin-Williams Company: [www.protective.sherwin-williams/industries](http://www.protective.sherwin-williams/industries).
- C. Substitutions: Section 01 6000 - Product Requirements.

### **202 SPECIAL COATING MATERIALS**

- A. Basis of Design: Special Coating products of Tnemec Company, Inc. are listed in the Coating Schedule as a standard of quality and performance. Technical information may be obtained from the following:
1. SteelCon Coating Systems, Inc.
  2. 2100 3rd Ave South
  3. Irondale, Alabama 35210
  4. Phone: 205-951-2086
  5. E Mail: [rcrumbaugh@tnemec.com](mailto:rcrumbaugh@tnemec.com)
- B. Substitutions: See Section 01 6000 - Product Requirements.
1. Only coatings that meet or exceed the performance of these specified coatings may be submitted for use. Substitution requests shall include the name of the specified material for which a substitute is being requested; name of the proposed substitute material; and a complete description of the proposed substitute including performance & test data, cure times, recoat windows, and generic composition. No request for substitution will be considered that would decrease film thickness or offer a change in the generic type of coating specified or would be considered a change to the generic chemistry of the coatings specified.

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**203 COLORS, MIXING, AND THINNING**

- A. Color shall be formed of pigments free of lead, lead compounds, or other materials that might be affected by the presence of hydrogen sulfide or other gases likely to be present at the Site.
- B. Where thinning is necessary, only the products of the manufacturer furnishing the coating will be allowed. All such thinning shall be done in strict accordance with the coating manufacturer's recommendations.
- C. Mix in accordance with the manufacturer's recommendations.

**204 SOURCE QUALITY**

- A. Source Quality: Obtain painting, coating, and thinning materials from a single manufacturer.

**PART 3 – EXECUTION**

**301 MANUFACTURER'S INSTRUCTIONS**

- A. Compliance: Comply with manufacturer's product data, including technical information, catalogue instructions, and product instructions listed on material containers.

**302 EXAMINATION**

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the timely and proper completion of the work. Materials removed and replaced to correct defects due to errant application such as overspray or drips on unsuitable surfaces shall be at the Contractor's expense.

**303 SURFACE PREPARATION**

- A. General:
  - 1. All surfaces to be coated shall be prepared as specified herein and in accordance with the coating manufacturer's recommendations. The object shall be to obtain a uniform, clean, and dry surface.
  - 2. Quality of surface preparation described herein is considered a minimum. If the coating manufacturer requires a higher degree of preparation, comply with the coating manufacturer's recommendations.
  - 3. Where surface dryness is questioned, test with a dampness-indicating instrument. Do not apply coatings over surfaces where moisture content exceeds that permitted by the coating manufacturer.
  - 4. Workmanship for surface preparation shall conform to the following Steel Structures Painting Council (SSPC) specification:
    - a. SSPC-SP1
    - b. SSPC-SP2
    - c. SSPC-SP3
    - d. SSPC-SP5
    - e. SSPC-SP6
    - f. SSPC-SP7
    - g. SSPC-SP10
    - h. SSPC-SP11
    - i. SSPC-SP12
- B. Ferrous Metal:
  - 1. New Steel: Prior to surface preparation all ferrous metals shall be cleaned of oil, grease and other contaminants in accordance with SSPC-SP 1 Solvent Cleaning. All surfaces shall be abrasive blast cleaned in accordance with SSPC-SP 10 Near White Blast

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Cleaning. Surface profile shall be 1.5 – 2.5 mils.

**3.04 APPLICATION**

- A. Surfaces shall be dry at the time of application.
- B. The minimum surface temperature shall be 50 degrees F and rising unless noted otherwise.
- C. Apply in strict accordance with the manufacturer's recommendations by brush, roller, spray, or other application method. The number of coats and thickness required is the same regardless of application method.
- D. Each coat shall be allowed to dry in accordance to the manufacturer's requirements. Drying time shall be construed to mean "under normal conditions." Where conditions other than normal exist, because of weather or because of confined space, longer times will be necessary.
- E. Coatings shall be applied to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable. Areas cut-in by brush prior to rolling shall have uniform appearance in comparison to adjoining surfaces.
- F. Edges of coatings adjoining other materials or other colors shall be sharp and clean without overlapping.
- G. Crevices and other hard to apply areas shall be back-rolled/back-brushed in conjunction with the field-applied prime coat.
- H. Where multiple coats of the same material are applied, each undercoat shall be slightly different in shade to facilitate identifying each coat.

**3.05 FINAL TOUCH-UP AND CLEANING**

- A. Prior to substantial completion, examine the coated surfaces and retouch or refinish surfaces to leave in condition acceptable to the ARCHITECT/OWNER.
- B. Remove masking, coatings, and other material from floors, glass, and other surfaces not scheduled to be coated.

**3.06 COATING SYSTEMS**

- A. Scheduled thickness or coverage rate is the minimum that will be accepted. Where thickness recommended by the manufacturer exceeds the minimum stated herein, comply with the thicker requirement.
- B. Coatings shall conform to the following schedule and coating manufacturer's recommendations.
- C. Ferrous structural steel shall be shop-primed. Field touch-up, where necessary, shall consist of surface preparation equivalent to what is specified and application of each coat that is in need of repair.

**3.07 SCHEDULE OF COATING SYSTEMS FOR EXTERIOR SERVICE**

- A. \*All coating thicknesses are expressed in dry film thickness (DFT.)
- B. Exposed Structural and Architecturally Exposed Ferrous Metals:
  - 1. Provide the following finish systems over exposed structural steel at main entrance canopy and in main entrance lobby where identified:
    - a. Shop Surface Preparation: SSPC-SP10 Near White Metal Blast Cleaning
    - b. Shop Primer: Tnemec Series 90-97 Tneme-Zinc applied at a rate to achieve 2.5 – 3.5 mils dry film thickness. Prime coat shall meet the following performance criteria:
      - 1) Generic Type: Organic Zinc Rich Urethane Primer
      - 2) Solids By Volume: 63%



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- 3) Zinc Content: 83% by weight. ASTM D520 Type III Zinc Dust
  - 4) Salt Spray (Fog): ASTM B 117, Scribed Panels, 50,000 hours exposure.
  - 5) Adhesion: ASTM 4541 Elcometer Adhesion.
  - 6) Humidity: ASTM D 4585. 4,000 hours exposure.
  - 7) Cathodic Disbondment: ASTM G8, Method A. Days Exposure
  - 8) Immersion: ASTM D 870 Potable Water Immersion. 7 years immersion.
  - 9) Prohesion: ASTM G 85 Prohesion Cabinet. 15,000 hours exposure.
- c. Field Touch-Up/Repair Surface Preparation: Shop applied primer damaged during shipping and erection shall be cleaned in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal. All edges shall be feathered. All surfaces shall be clean, dry and in a suitable condition to be coated.
- d. Touch-Up/Repair Primer: Tnemec Series 90-97 Tneme-Zinc applied at a rate to achieve 2.5 – 3.5 mils dry film thickness. Prime coat shall meet the following performance criteria:
- 1) Generic Type: Organic Zinc Rich Urethane Primer
  - 2) Solids By Volume: 63%
  - 3) Zinc Content: 83% by weight. ASTM D520 Type III Zinc Dust
  - 4) Salt Spray (Fog): ASTM B 117, Scribed Panels, 50,000 hours exposure.
  - 5) Adhesion: ASTM 4541 Elcometer Adhesion.
  - 6) Humidity: ASTM D 4585. 4,000 hours exposure.
  - 7) Cathodic Disbondment: ASTM G8, Method A. Days Exposure
  - 8) Immersion: ASTM D 870 Potable Water Immersion. 7 years immersion.
  - 9) Prohesion: ASTM G 85 Prohesion Cabinet. 15,000 hours exposure.
- e. Intermediate Coat: Tnemec Series 66 Hi Build Epoxoline applied at a rate to achieve 4.0 – 6.0 mils dry film thickness. Intermediate coat shall meet the following performance criteria:
- 1) Generic Type: Polyamide Epoxy
  - 2) Solids By Volume: 56%.
  - 3) Salt Spray (Fog): ASTM B 117. Result after 10,000 hours exposure (plane rust, rust at scribe and blistering).
  - 4) Immersion: ASTM D 870. 7 Years.
  - 5) Abrasion: ASTM 4060 (CS-17 Wheel, 1,000 gram load, 1,000 cycles)
  - 6) Adhesion: ASTM 4541 Elcometer Adhesion.
  - 7) Humidity: ASTM D 4585. 4,500 hours.
- f. Finish: Tnemec 1070 Fluoronar applied at a rate to achieve 2.0 – 3.0 mils dry film thickness (Available in high gloss (1070), semi-gloss (1071) and eggshell (1072)). Finish coat shall the following performance criteria:
- 1) Generic Type: Thermoset Fluoropolymer Polyurethane
  - 2) Solids By Volume: 60%.
  - 3) Salt Spray (Fog): ASTM B 117, 10,000 hours exposure
  - 4) Adhesion: ASTM 4541 Elcometer Adhesion.
  - 5) Abrasion: ASTM 4060 (CS-17 Wheel, 1,000 gram load, 1,000 cycles)
  - 6) Flexibility: ASTM D 522 (Method A)
  - 7) Hardness: ASTM 3363.
  - 8) Humidity: ASTM 4585, 3,000 hours exposure
  - 9) Impact: ASTM B2794
  - 10) QUV: ASTM D 4587, 16,000 hours exposure.
  - 11) QUV: ASTM D 4587, 25,000 hours exposure.

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- 12) Exterior Exposure: ASTM D 4141, Method C (EMMAQUA), 1,500 MJ/m<sup>2</sup> Exposure. Report gloss retention and color retention.
  - 13) Exterior Exposure: ASTM D 4141, Method C (EMMAQUA), 2,000 MJ/m<sup>2</sup> Exposure. Report gloss retention and color retention.
  - 14) Exterior Exposure: ASTM D 4141, Method C (EMMAQUA), 5,000 MJ/m<sup>2</sup> Exposure. Report gloss retention and color retention.
  - 15) AAMA 2605 (10 Years South Florida Exposure):

**308 COATING SYSTEM WARRANTY**

- A. The coating manufacturer shall provide to the Owner a 15 year warranty for the exterior coating system. The manufacturer shall warrant against (a) checking (b) cracking (c) blistering (d) delamination (e) color change as defined in the pre-approved warranty document (f) gloss change as defined in the pre-approved warranty document, and (g) chalking as defined in the pre-approved warranty document. To facilitate execution of the warranty, the Contractor shall provide the following:
  1. The painting contractor shall apply the intermediate and finish coat of the specified coating system to a minimum of 6 panels (to be supplied by Tnemec) of each finish color identified in the warranty.
  2. The panels shall be air dried for a minimum of 7 days and shipped to Tnemec Company prior to final acceptance of the work for verification color and gloss accuracy and for storage as the Original Project Color Standards for the duration of the warranty coverage.
  3. Tnemec shall forward the signed warranty document along with (2) two panels of each finish color to the Owner for retention by the Owner and (2) panels of each finish color to the painting contractor. These procedures are required to validate the warranty.
  4. All conditions of the product warranty shall be fulfilled by the contractor.

**END OF SECTION**

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**SECTION 10 1100  
VISUAL DISPLAY UNITS**

**PART 1 - GENERAL**

**101 RELATED DOCUMENTS:**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - 1. Section 04 2000 - Unit Masonry.
  - 2. Section 06 1000 - Rough Carpentry: Wood blocking.
  - 3. Section 09 2116 - Gypsum Board Assemblies.

**102 SUMMARY:**

- A. This Section includes the following types of factory-built visual display boards:
  - 1. Porcelain Enamel Steel Finish Markerboards.
  - 2. Vinyl covered cork tackboards.
  - 3. Anodized aluminum trim systems and accessories.
- B. All markerboards and tackboards shall be 4'-0" in height by lengths indicated on the Drawings.

**103 SUBMITTALS:**

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
  - 1. Product Data: Include manufacturer's data substantiating that tackboard materials comply with requirements indicated.
  - 2. Shop Drawings: Provide shop drawings for each type of markerboard, and tackboard required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
  - 3. Samples: Provide the following samples of each product for selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
    - a. Markerboards: Manufacturer's standard color charts consisting of actual sections of markerboard material and finish required, and where colors are not pre-selected, also showing the full range of colors available for each type of markerboard required.
    - b. Tackboards: Manufacturer's standard color charts consisting of actual sections of tackboard material and finish required, and where colors are not pre-selected, also showing the full range of colors, textures, and patterns available for each type of cork tackboard indicated.
    - c. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available, or pre-selected colors. Where finishes involve normal finish, texture, and/or color variations, include sets showing the full range of variations expected.
  - 4. Certificates: In lieu of laboratory test reports, when permitted by the Architect, submit the manufacturer's certification that cork tackboard materials furnished comply with requirements specified for flame spread ratings.
  - 5. Warranty: Provide manufacturer's sample warranty for each product proposed to be furnished. Upon acceptance, furnish actual executed warranty to the Contractor for submittal with Project Closeout Documents.

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**104 QUALITY ASSURANCE:**

- A. Fire Performance Characteristics: Provide tackboards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 10 or less.
- B. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the specific type and model indicated.
  - 1. Substitutions: Other visual display boards having equivalent performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.
  - 2. Refer to Section 01 6000 - "Product Requirements", for requirements and time limits for submitting requests for substitutions.
- C. Toxin-Free: Provide tackboard and markerboard products and assemblies which are free of any toxins, asbestos, harmful by-products, and carcinogens, including in part, all adhesives and glues.
  - 1. Tackboards shall be in compliance with Military Specification MIL-C-15116-C, Type II.
- D. Single Source Responsibility: Provide all markerboards, tackboards, trim, and accessories by one manufacturer for the entire project, unless otherwise accepted by Architect in writing.

**105 PROJECT CONDITIONS:**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting; Coordinate with the work of other trades. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
  - 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

**106 WARRANTY:**

- A. Provide manufacturer's standard written warranty for each markerboard and tackboard product furnished.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS/PRODUCTS:**

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Porcelain Enamel Steel Finish Markerboards:
    - a. Best-Rite Chalkboard Co.
    - b. Carolina Chalkboard Co.
    - c. Claridge Products and Equipment, Inc.
    - d. Greensteel, Inc.
    - e. Lemco, Inc.
    - f. Marsh Chalkboard Co.
    - g. Nelson Adams Co.
    - h. Newline Products, Inc. (501) 472-2479
    - i. Platinum Visual Systems (800) 498-2990

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2. Tackboards:
    - a. Best-Rite Chalkboard Co.
    - b. Carolina Chalkboard Co.
    - c. Claridge Products and Equipment, Inc.
    - d. Greensteel, Inc.
    - e. Lemco, Inc.
    - f. Marsh Chalkboard Co.
    - g. Nelson Adams Co.
    - h. Newline Products, Inc. (501) 472-2479
    - i. Platinum Visual Systems (800) 498-2990
  - B. Products: Subject to compliance with requirements, provide equivalent to the following products by one of the above named manufacturers.
    1. Porcelain Enamel Steel Finish Markerboards (24-gage; color: White):
      - a. Equivalent to Claridge Products and Equipment, Inc.; "LCS."
    2. Tackboards (color as selected):
      - a. Vinyl fabric on cork underlay with 1/4" hardboard or particleboard backing. Cork minimum 1/2" deep. Equivalent to Claridge Products and Equipment, Inc.; "Fabricork #1380".
    3. Aluminum Trim and Accessories (color as selected):
      - a. Equivalent to Claridge Products and Equipment, Inc.; "Series 1."
    4. Equivalent Products by those manufacturers named above, and/or other manufacturers properly submitted (refer to Section 01 6000 - "Product Requirements") at least 10 days prior to original Bid Date and subsequently accepted by Architect in writing or by Addendum will be acceptable.
    5. Colors: As selected by Architect.
    6. Sizes: Refer to Drawings.

**202 MATERIALS:**

- A. Tackboard Core: Provide the manufacturer's standard 1/4-inch-thick tempered hardboard core, or particleboard core.
- B. Markerboard Core: Provide the manufacturer's standard 7/16-inch thick medium density fiberboard (MDF), or reclaimed or recycled wood fiber, or particle board material.
- C. Backing Sheet: Provide the manufacturer's standard 0.005-inch thick aluminum foil backing.
- D. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.
- E. Porcelain Enamel Steel Finish Markerboards: Provide 7/16-inch-thick panel surfaced with the manufacturer's 24-gage steel sheet and porcelain enamel finish formulated for matte marker-receptive finish and for use of magnetic devices.
  1. Provide with 0.005-inch thick aluminum foil backing.

**203 ACCESSORIES:**

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
- B. Marker/Chalktray: Furnish manufacturer's standard continuous box-type aluminum marker/chalktray with slanted front and cast aluminum end closures for each markerboard.

- 
- C. Map Rail: Furnish continuous map rail at the top of each markerboard unit, complete with the following accessories:
1. Display Rail: Provide continuous cork display rail approximately 1-inch wide, integral with the map rail.
  2. End Stops: Provide one end stop at each end of the map rail.
  3. Map Hooks: Provide two metal map hooks with flexible metal clips for each three feet of map rail or fraction thereof.
  4. Flag Holder: Provide one flag holder in each classroom, at location as directed.

**204 FABRICATION:**

- A. Assembly: Provide factory-assembled markerboard and tackboard units, except where field-assembled units are required.
1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
  2. Provide manufacturer's standard mullion trim at joints between contiguous markerboard and tackboard.

**205 FINISHES:**

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).
1. Provide color anodized in lieu of clear, upon request by Architect.

**PART 3 - EXECUTION**

**301 INSTALLATION:**

- A. Deliver factory-built markerboard and tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
1. Mounting Height: Top of markerboard and tackboard units shall align and be at 7'-0" above finished floor, unless otherwise indicated.
  2. Mounting Height: Top of visual display rail: Mount as indicated.

**302 ADJUST AND CLEAN:**

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions. Break in markerboards only if and as recommended by the manufacturer.

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**END OF SECTION**



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**SECTION 10 1400  
SIGNAGE**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Emergency evacuation maps.
- D. Storm Shelter signs required by the ICC.
- E. Building identification signs.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.
- B. Section 09 9600 - High Performance Coatings: Finishing of exterior building identification sign.
- C. Division 22 - Mechanical Identification.
- D. Division 26 - Electrical Identification.

**103 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- D. NFPA 170 - Standard for Fire Safety and Emergency Symbols; 2021.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
  - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
  - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
  - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- G. Manufacturer's Qualification Statement.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

- 
1. See Section 01 6000 - Product Requirements, for additional provisions.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

**106 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

**107 FIELD CONDITIONS**

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

**108 WARRANTY**

- A. Provide manufacturer's standard warranty against defects in materials and workmanship for minimum 5 years.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Flat (Interior) Signs:
  1. Basis of Design: APCO Signs; [www.apcosigns.com](http://www.apcosigns.com).
  2. Other Acceptable Manufacturers:
    - a. TakeForm, Inc.; [www.takeform.net](http://www.takeform.net).
    - b. Best Sign Systems, Inc: [www.bestsigns.com/#sle](http://www.bestsigns.com/#sle).
    - c. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Exterior Building Identification Signs:
  1. Andco Industries Corporation.
  2. Cosco Industries: [www.coscoarchitecturalsigns.com/#sle](http://www.coscoarchitecturalsigns.com/#sle).
  3. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  4. Leeds Architectural Letters, Inc..
  5. Substitutions: See Section 01 6000 - Product Requirements.

**202 SIGNAGE APPLICATIONS**

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room, Directional, Informational, and Door Signs: Provide interior signage as indicated on the drawings.
  1. Sign Type: Flat signs with engraved panel media as specified.
  2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  3. Character Height: 1 inch unless indicated otherwise.
- C. Emergency Evacuation Maps:
  1. Map content to be provided by Owner.

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2. Allow for six (6) Emergency Evacuation Maps, unless otherwise indicated on the drawings.
  3. Mounting: Flush mounted.
  4. Size: 16 inches square, unless otherwise indicated on the drawings.
- D. Storm Shelter Signage Required by ICC-500:
1. Entrance Signage: Provide signage indicating "Tornado Shelter" at each entrance to storm shelter. See drawings for size and required content. Signage shall be tactile as well as visual in compliance with ICC A117.1 and 2010 ADA Standards.
  2. Access Signage: Provide signage depicting general location of storm shelter areas and accessways adjacent to the shelter access door on the inside of the shelter, in the designated storm shelter facility managers office, and at the Office of the facility manager.
  3. See drawings for ICC required Storm Shelter Signage requirements.
- E. Building Identification Signs:
1. Provide building identification sign as indicated on the drawings. Use metal components to match the exterior signage illustrated on the drawings.
  2. Shop prime and field finish the sign as indicated, in color to be selected by Architect.
  3. Mount on exterior as indicated on drawings.

### **203 SIGN TYPES**

- A. Flat Signs: Signage media without frame.
1. Edges: Square.
  2. Corners: Square.
  3. Wall Mounting of One-Sided Signs: Tape adhesive.
  4. Wall "Flag" Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
- B. Color and Font: Unless otherwise indicated:
1. Character Font: As indicated on drawings.
  2. Character Case: Upper and lower case (title case).
  3. Background Color: As scheduled.
  4. Character Color: Contrasting color.

### **204 TACTILE SIGNAGE MEDIA**

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
1. Total Thickness: 1/16 inch.

### **205 EXTERIOR BUILDING IDENTIFICATION SIGNS**

- A. Metal Letters and Forms:
1. Metal: Steel or Aluminum plate.
  2. Metal Thickness: 3/8 inch minimum.
  3. Text and Typeface:
    - a. Character Font: To be selected.
    - b. Character Case: To be selected.
  4. Finish: Finish shall be per Section 09 9600 - High Performance Coatings.
  5. Mounting: As indicated on drawings.

**206 ACCESSORIES**

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

**302 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

**END OF SECTION**

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**SECTION 10 2113.19  
PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Solid Plastic (HDPE) Toilet Compartments.
- B. Urinal screens.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions of the Contract and Division 1 Specification Sections, apply to this Section.
- B. Section 04 2000 - Unit Masonry: Wall construction.
- C. Section 06 1000 - Rough Carpentry: Blocking and supports.
- D. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

**103 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.
- C. Product Data: Provide data on panel construction, hardware, and accessories.
- D. Samples: Submit two samples of partition panels, 6x6 inch in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**106 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store and handle compartments as recommended by manufacturer to protect from damage.

**107 WARRANTY**

- A. Provide manufacturer's standard written warranty on its panels, pilasters, and doors against breakage, corrosion and delamination; to be replaced without charge, including labor.
  - 1. Period of warranty: Twenty five (25) year minimum.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments:
  - 1. Global Partitions; "Solid Plastic (HDPE)"; [www.globalpartitions.com](http://www.globalpartitions.com).
  - 2. Metpar Corp; "Polly HDPE Partitions": [www.metpar.com](http://www.metpar.com).

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3. Partition Systems International of South Carolina; PolyLife HDPE Toilet Partitions: [www.psisc.com](http://www.psisc.com).
  4. Scranton Products (Santana/Comtec/Capital); "Hiny Hiders Partitions" [Basis of Design]: [www.scrantonproducts.com](http://www.scrantonproducts.com).
  5. Substitutions: Section 01 6000 - Product Requirements.

## **202 SOLID PLASTIC TOILET COMPARTMENTS**

- A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), floor-mounted headrail-braced.
  1. Color: As selected, unless indicated on Finish Legend.
- B. Doors:
  1. Thickness: 1 inch.
  2. Width: 24 inch.
  3. Width for Handicapped Use: 36 inch, out-swinging, unless drawings indicate otherwise.
  4. Height: 66 inch.
- C. Panels:
  1. Thickness: 1 inch (25 mm).
  2. Height: 66 inch.
  3. Depth: As indicated on drawings.
- D. Pilasters:
  1. Thickness: 1 inch (25 mm).
  2. Width: As required to fit space; minimum 3 inches (76 mm).
- E. Screens: Without doors; to match compartments; mounted to wall with continuous stainless steel panel brackets with vertical support/bracing same as compartments, unless indicated otherwise.

## **203 MATERIALS**

- A. Solid plastic toilet partition: High density polyethylene (HDPE), 1-inch thick; with homogeneous color throughout. Waterproof, non-absorbent, graffiti resistant, and highly impact resistant.

## **204 ACCESSORIES**

- A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 in high, concealing floor fastenings.
  1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow stainless steel, 1 x 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.
- C. Pilaster Brackets: Satin stainless steel.
- D. Wall Brackets: Full height, continuous type, satin stainless steel.
- E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- F. Hardware:
  1. Hinge: 14 gauge continuous, stainless steel, satin.
  2. Nylon bearings.
  3. Door Latch: Slide type with exterior emergency access feature, cast stainless steel; polished satin finish.

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4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch, cast stainless steel; polished stainless finish.
  5. Coat hook with rubber bumper; one per compartment, mounted on door, cast stainless steel, with polished satin finish.
  6. Provide door pull for outswinging doors, cast stainless steel; polished satin finish.
  7. Accessible Toilet Compartments shall have self-closing door. Door pull shall be placed on both sides of the door near latch, and shall comply with 2010 ADA Standard 404.2.7. Door pull shall have a loop or U-shaped handle immediately below the latch on both sides of the door. Locking hardware shall be centered at 34" minimum above finished floor to 48" maximum above finished floor with 5 lbs maximum force, operable with one hand and requires no tight grasping, pinching or twisting of wrist.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

**302 INSTALLATION**

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

**303 TOLERANCES**

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

**304 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

**END OF SECTION**



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**SECTION 10 2800  
TOILET ACCESSORIES**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. Section includes surface preparation and the application of paint systems on interior substrates.
  - 1. Public-use washroom accessories
  - 2. Public-use shower room accessories
  - 3. Warm-air dryers
  - 4. Childcare accessories
  - 5. Underlavatory guards
  - 6. Custodial accessories
- B. Related Requirements:
  - 1. Section 088300 "Mirrors" for frameless mirrors.

**1.03 COORDINATION**

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

**1.04 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
  - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify products using designations indicated.

**1.05 INFORMATIONAL SUBMITTALS**

- A. Sample Warranty: For manufacturer's special warranty.

**1.06 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For accessories to include in maintenance manuals.

**1.07 QUALITY ASSURANCE**

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from a single source from a single manufacturer.

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- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

**108 WARRANTY**

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, visible silver spoilage defects.
  - 2. Warranty Period: 15 years from date of Substantial Completion.

**PART 2 PRODUCTS**

**201 PERFORMANCE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

**202 MANUFACTURER**

- A. Basis-of-Design Products: Subject to compliance with requirements, provide the listed Basis-of-Design Products.
  - 1. Bobrick Washroom Equipment, Inc. (Basis-of-Design Product Manufacturer)

**203 ADDITIONAL MANUFACTURERS**

- A. Koala (Childcare Accessories Only)
- B. Xcelerator (Warm Hand Dryers)
- C. Plumberex (Underlavatory Guards Only)
  - 1. Or comparable products by one of the following:
    - a. American Specialties, Inc.
    - b. Bradley Corporation.
  - 2. Alternate products submitted for consideration (from one of the manufacturers listed above) must show an itemized comparison with each product named below.

**204 PUBLIC-USE WASHROOM ACCESSORIES**

- A. Toilet Tissue Dispenser (Standard Roll): **TA01 (Owner Furnished)**
- B. Waste Receptacle, Surface Mount, Large: TA13
  - 1. Basis-of-Design Product: Bobrick B-277
  - 2. Mounting: Surface Mounted.
  - 3. Minimum Capacity: 12.75 gallon.
  - 4. Material and Finish: Stainless steel, No. 4 satin finish.
  - 5. Waste Receptacle Profile: Arc-front.
  - 6. Trash Liner Holder: Removable holding device designed to facilitate installation and removal of disposable trash liners and to retain liner inside waste receptacle. Device shall have a molded plastic sleeve with a stainless steel U-shaped support strap.
- C. Soap Dispenser: **TA18 (Owner Furnished)**
- D. Grab Bar (short): TA23
  - 1. Basis-of-Design Product: Bobrick B-6806 x 18
  - 2. Mounting: Flanges with concealed fasteners.
  - 3. Material and Finish:
    - a. Material: Stainless steel, 0.05 inch thick.
    - b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area.
    - c. Outside Diameter: 1-1/2 inches.

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- d. Configuration and Length: Straight, 18 inches long.
  - E. Grab Bar (medium): TA24
    - 1. Basis-of-Design Product: Bobrick B-6806 x 36
    - 2. Mounting: Flanges with concealed fasteners.
    - 3. Material and Finish:
      - a. Material: Stainless steel, 0.05 inch thick.
      - b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area.
      - c. Outside Diameter: 1-1/2 inches.
      - d. Configuration and Length: Straight, 36 inches long.
  - F. Grab Bar (long): TA25
    - 1. Basis-of-Design Product: Bobrick B-6806 x 42
    - 2. Mounting: Flanges with concealed fasteners.
    - 3. Material and Finish:
      - a. Material: Stainless steel, 0.05 inch thick.
      - b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area.
      - c. Outside Diameter: 1-1/2 inches.
      - d. Configuration and Length: Straight, 42 inches long.
  - G. Grab Bar: TA22
    - 1. Basis-of-Design Product: Bobrick B-6806 x 24
    - 2. Mounting: Flanges with concealed fasteners.
    - 3. Material and Finish:
      - a. Material: Stainless steel, 0.05 inch thick
      - b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area
      - c. Outside Diameter: 1-1/2 inches
      - d. Configuration and Length: Straight, 24inches long
  - H. Mirror, Framed, without Shelf: TA26
    - 1. Basis-of-Design Product: Bobrick B-165-2436
    - 2. Frame: Stainless steel channel.
    - 3. Corners: Mitered, welded, and ground smooth.
    - 4. Hangers: Produce rigid, tamper and theft-resistant installation, using one-piece, galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
    - 5. Size: 24 inches wide x 36 inches high.
  - I. Robe Hook: TA33
    - 1. Basis-of-Design Product: Bobrick B-6717
    - 2. Mounting: Surface mounted.
    - 3. Material and Finish: Stainless steel, No. 4 satin finish.
  - J. Sanitary Napkin Disposal Unit, Surface-mount: TA36
    - 1. Basis-of-Design Product: Bobrick B-35139
    - 2. Mounting: Surface mounted.
    - 3. Door or Cover: Self-closing disposal opening cover and hinged face panel.
    - 4. Receptacle: Removable.
    - 5. Material and Finish: Stainless steel, No. 4 satin finish.

**205 PUBLIC USE SHOWER ROOM ACCESSORIES**

- A. Shower Curtain Rod, Extra-Heavy-Duty (straight): TA41

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1. Basis-of-Design Product: Bobrick B-6047
  2. Description: 1-1/4 inch OD; fabricated from nominal 0.0375-inch-thick stainless steel.
  3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
  4. Finish: Stainless steel, No. 4 satin finish.
- B. Shower Curtain: TA42
1. Basis-of-Design Product: Bobrick B-XX
  2. Description:
  3. Size: Minimum 6 inches wider than opening by 72 inches high.
  4. Material: Duck, minimum 8 oz., white, 100 percent cotton.
  5. Color: White.
  6. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
  7. Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
- C. Shower Seat, Folding-Type: TA44
1. Basis-of-Design Product: Bobrick B-5181
  2. Description: Fold-up, reversible shower seat complete with mounting kits, anchor, and accessories, as required to support 360 lbs. in compliance with accessible design guidelines.
  3. Configuration: L-shaped seat, designed for wheelchair access.
  4. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
  5. Mounting Mechanism: Stainless steel, No. 4 satin finish.
  6. Width: 33 inches.

## **206 WARM AIR DRYERS**

- A. Warm Air Dryer: TA80
1. Basis-of-Design Product: Xcelerator
  2. Mounting: Surface mounted.
  3. Operation: Electronic sensor activated with timed power cut-off switch.
    - a. Operation time: 30 to 40 seconds.
    - b. Cover Material and Finish: Stainless steel, No. 4 satin finish.
    - c. Electrical Requirements: 115V, 12.2A, 1400W.

## **207 CHILDCARE ACCESSORIES**

- A. Diaper-Changing Station: TA85
1. Basis-of-Design Product: Koala KB110-SSWM
  2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
    - a. Engineered to support a minimum of 250-lb static load when opened.
    - b. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
    - c. Operation: By pneumatic shock-absorbing mechanism.
    - d. Material and Finish: Stainless steel, No. 4 satin finish.
    - e. Liner Dispenser: Built in.

## **208 UNDERLAVATORY GUARDS**

- A. Underlavatory Guard: TA58
1. Basis-of-Design Product: Plumberex Soft Guard Plus

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

**209 CUSTODIAL ACCESSORIES**

- A. Mop and Broom Holder: TA60
  1. Basis-of-Design Product: Bobrick B-224 x 36
  2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
  3. Length: 36 inches.
  4. Hooks: Three.
  5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
  6. Material and Finish: Stainless steel, No. 4 satin finish.
    - a. Shelf: Not less than nominal 0.05 inch thick stainless steel.
    - b. Rod: Approximately 1/4-inch-diameter stainless steel.

**210 MATERIALS**

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

**211 FABRICATION**

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of \_\_\_\_\_keys to Owner's representative.

**PART 3 EXECUTION**

**301 INSTALLATION**

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

**302 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- 
- B. Remove temporary labels and protective coatings.
  - C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION**

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**SECTION 10 4300  
EMERGENCY AID AND SECURITY SPECIALTIES**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Automated external defibrillators (AEDs).
- B. Automated external defibrillator (AED) cabinets.
- C. First Aid Kit for Tornado Storm Shelter.
- D. Accessories.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 09 9123 - Interior Painting: Field paint finish.

**103 DEFINITIONS**

- A. Automated External Defibrillator (AED): A Food and Drug Administration (FDA)-approved portable device, which automatically analyzes the heart rhythm and recognizes the presence of ventricular fibrillation and/or tachycardia. If defibrillation is warranted, the AED automatically charges and prompts (visual and/or audio) the operator to deliver an electrical shock.

**104 REFERENCE STANDARDS**

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide color and finish, anchorage details, and installation instructions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test schedules and recertification requirements.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Automated External Defibrillators (AEDs):
  - 1. Philips Medical Systems; HeartStart FRx: [www.usa.philips.com/#sle](http://www.usa.philips.com/#sle).
  - 2. Stryker Corporation; HeartSine samaritan PAD 450P: [www.stryker.com/#sle](http://www.stryker.com/#sle).
  - 3. ZOLL Medical Corporation; \_\_\_\_\_: [www.zoll.com/#sle](http://www.zoll.com/#sle).
- B. Emergency Aid Cabinets and Accessories:
  - 1. Basis of Design: Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
  - 2. Other Acceptable Manufacturers:
    - a. Modern Metal Products, a division of Technico, Inc: [www.modern-metal.com/#sle](http://www.modern-metal.com/#sle).
  - 3. Substitutions: See Section 01 6000 - Product Requirements.



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**202 EMERGENCY AID CABINETS**

- A. Type: Automated external defibrillator (AED).
- B. Cabinet Construction: Non-fire-rated.
  - 1. Formed aluminum base metal.
- C. Cabinet Configuration: Semi-recessed type.
  - 1. Size to accommodate AED and bleeding control kit.
  - 2. Trim: Flat square edge, with 1 inch wide face.
  - 3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with wire pull handle and nylon catch. Hinge door for 180 degree opening with two butt hinges.
- E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- F. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.
- G. Fabrication: Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

**203 ACCESSORIES**

- A. Cabinet Door Signage: "AED and Bleeding Control Kit" decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).
- B. First Aid Kit for Tornado Storm Shelter: Furnish and install a First Aid Kit compliant with ICC 500 (2020) - ICC/ NSSA Standard for the Design and Construction of Storm Shelters, including the referenced standard ANSI/ ISEA Z308 - Minimum Requirements for Workplace First Aid Kits for Class A First Aid Kit. Size the kit to comply with the occupancy of the shelter, see Code Compliance Data on the drawings.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

**302 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings at elevation compliant with applicable Code and ADA.
- C. Secure rigidly in place.
- D. Owner will furnish and install Bleeding Control Kit and AEDs in cabinets.
- E. Cabinet Lettering:
  - 1. Location: Face of glazing surface.

**303 ADJUSTING AND CLEANING**

- A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

- 
- B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.
  - C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
  - D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

**304 CLOSEOUT ACTIVITIES**

- A. See Section 01 7800 - Closeout Submittals for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training for additional requirements.
- C. Demonstrate proper operation of door security lockdown device to Owner's designated representative.

**END OF SECTION**

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**SECTION 10 4400  
FIRE PROTECTION SPECIALTIES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Secure Key Safe.
- D. Accessories.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections apply to this Section.
- B. Section 04 2000 - Unit Masonry.
- C. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- D. Section 09 2116 - Gypsum Board Assemblies: Roughed-in wall openings.

**103 REFERENCE STANDARDS**

- A. FM (AG) - FM Approval Guide; Current Edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**105 FIELD CONDITIONS**

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Fire Extinguisher Cabinets and Accessories:
  - 1. Amerex Corp.: [www.amerex-fire.com](http://www.amerex-fire.com)
  - 2. Larsen's Manufacturing Co: [www.larsensmfg.com/#sle](http://www.larsensmfg.com/#sle).
  - 3. Nystrom: [www.nystrom.com](http://www.nystrom.com).
  - 4. Potter-Roemer: [www.potterroemer.com/#sle](http://www.potterroemer.com/#sle).
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

**202 FIRE EXTINGUISHERS**

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

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1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
  - B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
    1. Stored Pressure Operated: Deep Drawn.
    2. Class: A:B:C type.
    3. Size and classification: UL-rated 4-A: 60-B: C, 10 pound nominal capacity.
    4. Finish: Baked polyester powder coat red color.
    5. Extent: For all locations indicated, except kitchen or food prep areas.
    6. Temperature range: Minus 40 degrees F to 120 degrees F.
  - C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
    1. Class: K.
    2. Size and classification: UL-rated 10K, 5-pound nominal capacity.
    3. Finish: Polished stainless steel.
    4. Temperature range: -20 degrees F to 120 degrees F.
    5. Extent: For kitchen and food prep areas.

**203 FIRE EXTINGUISHER CABINETS**

- A. Cabinet Configuration: Semi-recessed type, unless shown otherwise.
  1. Sized to accommodate accessories and extinguisher.
  2. Trim: rolled edge, 2.5 inch wide (unless indicated otherwise) face.
- B. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinges. Provide nylon catch. Door style equal to Larsens "Vertical Duo".
- C. Door Glazing: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- E. Fabrication: Weld, fill, and grind components smooth.
- F. Finish of Cabinet Exterior Trim and Door: Stainless Steel, Type 304, brushed finish.
- G. Finish of Cabinet Interior: Stainless Steel, Type 304, brushed finish.

**204 SECURE KEY SAFE**

- A. Product: Recessed, Heavy Duty, 10 Key, Knox Box Series 3200. Quantity: 1 per building. [www.knoxbox.com](http://www.knoxbox.com).

**205 ACCESSORIES**

- A. Extinguisher Brackets (if required): Formed steel, galvanized and enamel finished.
- B. Cabinet Signage: Red letters: "Fire Extinguisher".

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

**302 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

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- B. Install cabinets plumb and level in wall openings; see drawings for mounting height, or, if not indicated, at height to comply with applicable regulations of governing authorities.
  - C. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.
  - D. Secure rigidly in place.
  - E. Install one fire extinguisher in each fire extinguisher cabinet and bracket.
  - F. Recessed installation of Secure Key Safe Boxes: location to be coordinated with local Fire Marshall. Install according to manufacturer's recommendations.

**END OF SECTION**

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**SECTION 10 5129  
PHENOLIC LOCKERS**

**PART 1 GENERAL**

**101 SECTION INCLUDES**

- A. Phenolic lockers.

**102 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete Concrete base construction.
- B. Section 06 1000 - Rough Carpentry Wood blocking and nailers.

**103 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
- D. Full Size Sample: One full-size locker of each construction specified for evaluation of construction.
- E. Manufacturer's Installation Instructions: Indicate component installation assembly.

**105 DELIVERY, STORAGE, AND HANDLING**

- A. Protect locker finish and adjacent surfaces from damage.

**PART 2 PRODUCTS**

**201 MANUFACTURERS**

- A. Phenolic Lockers:
  - 1. Hollman: "Genesis" [www.hollman.com/#sle](http://www.hollman.com/#sle). [basis of design]
  - 2. Substitutions: See Section 01 6000 - Product Requirements.

**202 LOCKER APPLICATIONS**

- A. Athletic Lockers: Phenolic lockers, free-standing with matching closed base.
  - 1. Width: 18 inches.
  - 2. Depth: 18 inches.
  - 3. Height: 72 inches.
  - 4. Locker Configuration: Single tier.
  - 5. Fittings: Size and configuration as indicated on drawings.
    - a. Upper shelf.
    - b. Lock box.
    - c. Coat rod.
    - d. Hooks: One double prong.
    - e. Footlocker with hinged top/seat.
    - f. Single shoe shelf.
  - 6. Provide sloped top.



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**203 PHENOLIC LOCKERS**

- A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
  - 1. Doors: Full overlay, covering full width and height of locker body; square edges.
  - 2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
  - 3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
  - 4. Door Color: As selected by Architect; allow for 2 different colors.
  - 5. Body Color: Manufacturer's standard white or light color.
  - 6. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.
- B. Component Thicknesses:
  - 1. Doors: 1/2 inch minimum thickness.
  - 2. Locker Body: One of the following combinations:
    - a. Tops, bottoms, and shelves 1/2 inch; sides 3/8 inch; backs 1/4 inch; minimum.
  - 3. End Panels and Filler Panels: 1/2 inch minimum thickness.
  - 4. Toe Kick Plates: 1/2 inch minimum thickness.
- C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
  - 1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.
- D. Hinges: Stainless steel, black powder coat finish; minimum of 180 degree opening; either exposed barrel 5-knuckle hinge attached to back of door and inside of body with tamperproof screws, or concealed cabinet style hinge attached with tamperproof screws.
- E. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.
- F. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed.
- G. Locks: Locker manufacturer's standard type indicated above.
- H. Lock Strike: Stainless steel, or black high impact ABS plastic strike plate attached to locker body with throughbolts.

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

**302 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- D. Bolt adjoining locker units together to provide rigid installation.
- E. Install end panels, filler panels, and sloped tops.

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- F. Install accessories.
  - G. Replace components that do not operate smoothly.

**303 CLEANING**

- A. Clean locker interiors and exterior surfaces.

**END OF SECTION**

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**SECTION 10 5626.13  
MOBILE STORAGE SHELVING UNITS**

**1.1 RELATED DOCUMENTS**

**1.01 SUMMARY**

This Section includes the following:

1. Mechanically assisted, carriage mounted high-density mobile storage units, support rails, fabrication, and installation including leveling of support rails.
  - a. Related Work, Not Furnished:
    - 1) Structural floor system capable of supporting live and dead loads required by prevailing building codes, including rolling loads of storage units to be installed.
    - 2) Finish floor covering materials and installation
  - b. Related Sections:
    - 1) Section 03300 - Concrete Work
    - 2) Sections in Division 9 - Finishes, relating to finish floor and base materials.

**1.3 REFERENCES**

1. American Library Association (when applicable)
  - a. Cantilever Bracket Type Metal Library Bookstacks; Library Technology Reports.]
2. American National Standards Institute (ANSI) Standards:
  - a. Applicable standards for fasteners used for assembly.
3. American Society for Testing and Materials (ASTM) Standards:
  - a. Applicable standards for steel materials used for fabrication.
4. American Institute Of Steel Construction (AISC) Standards:
  - a. Applicable standards for steel materials used for fabrication.

**1.02 SYSTEM DESCRIPTION**

- A. General: The system consists of manufactured storage units mounted on manufacturer's track-guided carriages to form a compact storage system. System design permits access to any single aisle by manually moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.
- B. Carriage System Design and Features: The carriage system consists of a formed structural steel frame with machined and balanced wheels riding on steel rails recessed mounted to the floor. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. Rail types, quantities and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
- C. Movement Controls: Triple or single arm operating wheels with rotating hand knobs shall be provided on the accessible (drive) ends of shelf units, centered on the end panel, located 40 inches from the base of each unit to permit units to be moved to create a single aisle opening. Turning the handle transmits power through chain drive to drive wheels on each carriage.
- D. Drive System: The system shall be designed with a positive type mechanically-assisted drive which minimizes end play, ensures there is no play in the drive handle, and that carriages will stop without drifting.
  1. System shall include a chain sprocket drive system for each movable carriage to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads. All system components shall be selected to ensure a smooth, even movement along the

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- entire carriage length. Drive system gearing shall be designed to permit 1 lb. of force applied to the drive handle to move a minimum of 4,000 lbs. of load.
  - 2. A tensioning device shall be provided on each chain drive with provision for adjusting tension without removing end panels.
  - 3. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
  - E. Safety Features:
    - 1. Color-coded visual indicators shall provide verification that carriages are in a locked or unlocked mode.
    - 2. A single safety lock button, mounted on each operating wheel hub, will permit moving a carriage in either direction to create a new access aisle when pulled out (unlocked), or locking the carriage when pushed in.
  - F. Finishes:
    - 1. Fabricated Metal Components and Assemblies: Manufacturer's standard powder coat paint finish.
    - 2. End Panels, Accessible Ends: Plastic laminate, manufacturer's standard textures and patterns.

### **1.03 PERFORMANCE REQUIREMENTS**

- A. Design Requirements:
  - 1. See Drawings for Details.
- B. Ease of Movement: Provide mechanically assisted units capable of being moved by exerting a maximum horizontal force of 5 pounds on the operating wheel.
- C. Seismic Performance: Provide mobile storage units capable of withstanding the effects of earthquake movement when required by applicable building codes.

### **1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of shelving, track and installation accessory required. Include data substantiating that products to be furnished comply with requirements of the contract documents.
- B. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of installation layout including clearances, spacings, and relation to adjacent construction in plan, elevation, and sections. Indicate clear exit and access aisle widths; access to concealed components; assemblies, connections, attachments, reinforcement, and anchorage; and deck details, edge conditions, and extent of finish flooring within area where units are to be installed.
  - 1. Show installation details at non-standard conditions. Furnish floor layouts, technical and installation manuals for every unit shipment with necessary dimensions for rail layout and system configuration at the project site. Include installed weight, load criteria, furnished specialties, and accessories.
  - 2. Provide layout, dimensions, and identification of each unit corresponding to sequence of installation and erection procedures. Specifically include the following:
    - a. Location, position and configuration of tracks on all floors.
    - b. Plan layouts of positions of carriages, including all required clearances.
    - c. Details of shelving, indicating method and configuration of installation in carriages.
  - 3. Provide location and details of anchorage devices to be embedded in or fastened to other construction.
  - 4. Provide installation schedule and complete erection procedures to ensure proper installation.

- 
- C. Samples: Provide minimum 3 inch square example of each color and texture on actual substrate for each component to remain exposed after installation.
  - D. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.
  - E. Warranty: Must be included in submittal packet.
  - F. Maintenance Data: Provide in form suitable for inclusion in maintenance manuals for mobile storage units. Data shall include operating and maintenance instructions, parts inventory listing, purchase source listing, emergency instructions, and related information.
    - 1. Submit manufacturer's instructions for proper maintenance materials and procedures.
    - 2. Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against using materials and methods which may be detrimental to finishes and performance.
  - G. Reference List: Provide a list of recently installed mobile storage units to be visited by owner, architect, and contractor. Intent of list is to aid in verifying the suitability of manufacturer's products and comparison with materials and product specified in this section.
  - H. Sustainable Design Submittal: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information:
    - 1. Environmental Product Declarations (EPD)
    - 2. Material Ingredients Documentation demonstrating the chemical inventory of the product to at least 0.1% (1,000ppm) (HPD)

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for the design, production, installation and service of carriage mounted high-density mobile storage units and support rails. Furnish certificate attesting manufacturer's ISO 9001 quality system registration.
- B. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing carriages and anchoring shelving units to carriages.
- C. Minimum Qualifications: 1-year experience installing systems of comparable size and complexity to specified project requirements.
  - 1. Guaranteed 24-hour service response time.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.

#### **1.07 PROJECT CONDITIONS**

- A. Field Measurements: Verify dimensions before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating mobile storage units. Coordinate construction to ensure actual dimensions correspond to established dimensions.

#### **1.08 SEQUENCING AND SCHEDULING**

- A. Sequencing: Coordinate storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.

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- B. Scheduling: Plan installation to commence after finishing operations, including painting have been completed.
  - C. Built-In Items: Provide components which must be built in at a time which causes no delays general progress of the Work.
  - D. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing mobile storage units including, but not limited to, the following:
    - 1. Review project conditions and levelness of flooring and other preparatory work performed under other contracts.
    - 2. Review and verify structural loading limitations.
    - 3. Recommended attendees include:
      - a. Owner's Representative.
      - b. Prime Contractor or representative.
      - c. The Architect.
      - d. Manufacturer's representative.
      - e. Subcontractors or installers whose work may affect, or be affected by, the work of this section.

**1.09 WARRANTY**

- A. Provide a written warranty, executed by Contractor, Installer, and Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have under General Conditions provisions of the Contract Documents.
- B. Warrant the entire movable compact shelving installation against defects in materials and workmanship for a period of five years from date of acceptance by the Owner.

**PART 2 – PRODUCTS**

**1.01 MANUFACTURERS**

- A. General: Products are based upon mobile shelving system products manufactured by Spacesaver Corporation. Alternate Manufacturers may be considered, must be approved by Architect 10 days prior to original posted bid date.
  - 1. Providers
    - a. Patterson Pope, Local Design Consultant, mhails@pattersonpope.com
    - b. Southwest Solutions Group
    - c. Bradford Systems

**1.02 BASIC MATERIALS**

- A. General: Provide materials and quality of workmanship which meet or exceed established industry standards for products specified. Material thicknesses/gauges are manufacturer's option unless indicated otherwise.
  - 1. Plastic Laminates: NEMA LD-3, GP-28, Vertical Grade.

**1.03 GROUT**

- 1. General: Provide non-shrink, non-staining hydraulic cement compound conforming to the following requirements, based on the performance of the test specimens at room temperature and in laboratory air.
- 2. Linear Movement: No shrinkage while setting; maximum expansion limited to .002 inches per linear inch.

- 
3. Compressive Strength: Based on two inch cubes made following ASTM standards, tested on a Balding-Southward machine of 60,000 pounds capacity, meet or exceed the following:
    - a. 1 hour
      - 1)

**104 MANUFACTURED COMPONENTS**

**A. Rails:**

1. Material: ASTM/AISI Type 1035 or 1045 steel, manufacturer's selection.
2. Capacity: 1,000 pounds per lineal foot (1385kg/M) of carriage.
3. Minimum Contact Surface: 5/8 inch wide.
4. Provide rail sections in minimum 6 foot lengths.
5. (Required) Spacsaver standard rail type, "B Anti-Tilt" rails.
6. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.
7. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections. Butt joints are not permitted.
8. Anti-Tip Rail Form Covers: Manufacturer shall provide for required protection, to prevent damage to rails during concrete back pours. When anti-tip devices are installed.

**B. Carriages:**

1. Provide manufacturer's design movable carriages fabricated of welded or bolted steel construction. Galvanized structural components and/or riveted carriages are unacceptable.
2. Provide fixed carriages of same construction and height as the movable carriages, anchored to rails. Setting fixed shelving directly on floors is not permitted.
3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.
4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of 3/4 inch. Top mount carriages are unacceptable.
5. Provide each carriage with two wheels per rail.

**C. Drive / Guide System:**

1. Design: Provide drive system which prevents carriage whipping, binding and excessive wheel/rail wear under normal operation.
  - a. If line shafts are used, all wheels on one side of carriage shall drive.
  - b. If synchronized drives are used, a minimum of one wheel assembly driving both sides of carriage at center location required. Drive shaft shall exhibit no play or looseness over the entire length of that assembly.
2. Shafts: Solid steel rod or tube.
3. Shaft Connections: Secured couplings.
4. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.

**D. Wheels:**

1. Capacity: Minimum load capacity per wheel: 3200 lbs (1455kg).
2. Size: Minimum 5 inches, outside diameter drive wheels.
3. Guides: Determined by manufacturer; minimum 2 locations.

**E. Face Panels:**

1. Materials: Plastic laminate clad particle board with plastic edging on vertical edges.



2. Finishes: Selected from manufacturer's standard available colors and patterns.

**F. Accessories:**

1. (Required) Anti-Tip Devices: Provide manufacturer's standard fixtures.
2. (Required) Mechanical Sweep and Safety Stop (Non-Powered).

Every potential aisle shall be protected with a 3" (2.99 inch) high extruded aluminum safety sweep, hinged from the carriage using spring steel leaf springs, with the base edge maximum  $\frac{3}{4}$ " (19mm) from the floor. The carriage(s) shall stop when depressed at any location along the leading edge of the sweep surface. Activated safety sweep shall engage an impact- absorbing friction disk brake to protect occupants, stored media and the carriage system itself via a sheathed cable system comprised of aircraft-grade  $\frac{3}{64}$ " (1.2mm) stainless steel core cables housed inside lined conduit. Safety sweep shall have bright, red and white safety identification tape applied full length marking its location. Safety sweep shall run the full length of both sides of each moveable carriage for full aisle coverage.

Mechanical safety sweep shall automatically reset to enable mobile system users to freely and safely back carriages away from aisle obstructions simply by reversing the direction of the rotating handle.

Safety sweep shall be operational when the carriages are not moving. Should a sweep be activated in an open aisle, the carriage with the activated sweep will not close on that aisle. Safety sweep shall automatically reset if activated and then released when the carriages are not moving.

Safety sweep shall require no electrical power or batteries to operate.

**1.05 FABRICATION**

- A. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.
- B. Wheels: Provide precision machined and balanced units with permanently shielded and lubricated bearings.
- C. Carriages: Fabricate to ensure no more than 1/4 inch maximum deviation from a true straight line. Splice and weld to ensure no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.
- D. Shelving, Supports and Accessories: See individual descriptions in "Shelving" paragraphs.

**1.06 FINISHES**

- A. Colors: Selected from manufacturer's standard available colors.
- B. Paint Finish: Provide factory applied electrostatic powder coat paint. Meet or exceed specifications of the American Library Association.
- C. Laminate Finish: Provide factory applied laminate panels at locations indicated on approved shop drawings.
- D. Edgings: Provide preformed edging, color-matched to unit colors selected.

**PART 3 - EXECUTION**

**2.01 EXAMINATION**

- A. Examine floor surfaces with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.
- B. Verify that building structural system is adequate for installing mobile storage units at locations indicated on approved shop drawings.

- 
1. In new construction, ensure that recesses for rails in floors are at proper spacing and depths, with allowance for grouting.
  - C. Verify that intended installation locations of mobile storage units will not interfere with nor block established required exit paths or similar means of egress once units are installed.
  - D. Prepare written report, endorsed by Installer, listing conditions detrimental to proper performance of mobile storage units, once installed.
  - E. Proceed with installation only after unsatisfactory conditions have been corrected.

## **202 INSTALLATION**

### **A. Rails:**

1. Lay out rails using full length units to the maximum extent possible. Use cut lengths only at ends to attain total length required. Locate and position properly, following dimensions indicated on approved shop drawings. Verify thickness of finished floor materials to be installed (by others) and install level 1/16 inch above finished floor surfaces.
2. Verify level, allowing for a minimum 1/4 inch of grout under high points. Position and support rails so that no movement occurs during grouting.
3. Set rails in full grout bed, completely filling any voids entire length of all rails including rail connectors. Trim up sides flush with rails to ensure proper load transfer from rail to supporting floor. Using shims in lieu of full grouting is not permitted.
4. Installation Tolerances: Do not exceed levelness of installed rails listed below:
  - a. Maximum Variation From True Level Within Any Module: 3/32 inch.
  - b. Maximum Variation Between Adjacent (Parallel) Rails: 1/16 inch, perpendicular to rail direction.
  - c. Maximum Variation In Height: 1/32 inch, measured along any 10 foot rail length.
5. Verify rail position and level; anchor to structural floor system with anchor type and spacings indicated on approved shop drawings.
  - a. ADA Accessible Ramps: Maximum 1:12 slope (4.76 degrees).
  - b. Other Ramps: Maximum 9 degree slope (1.9:12).
6. Vertical Transition, Ramp edge to floor: Maximum 1/8 inch.

### **B. Shelving Units Installation:**

1. General: Follow layout and details shown on approved shop drawings and manufacturer's printed installation instructions. Position units level, plumb; at proper location relative to adjoining units and related work.
2. Carriages:
  - a. Place movable carriages on rails. Ensure that all wheels track properly and centering wheels are properly seated on centering rails. Fasten multiple carriage units together to form single movable base where required.
  - b. Position fixed carriage units to align with movable units.
3. Shelving Units:
  - a. Permanently fasten shelving units to fixed and movable carriages with vibration-proof fasteners.
  - b. Stabilize shelving units following manufacturer's written instructions. Reinforce shelving units to withstand the stress of movement where required and specified.

### **C. Shelving and Accessories:**

1. Shelving, must be manufactured by the same manufacturer of the mobile system. provide manufacturers standards, as shown on drawings.
2. Hang Rods, to be manufacturers standard and placed at center of depth of garment hanger faces of shelving. hang rods must have a minimum of 8 connection points to

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shelving uprights.

3. Drawers must be a of welded construction. A minimum of 18 ga. steel, with double bends at all corners. Color selection for these drawers can be a second primary standard color, at no additional charge.

**203 FIELD QUALITY CONTROL**

- A. Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer's instructions.
- B. Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminate evidence of replacement.

**204 ADJUSTING**

- A. Adjust components and accessories to provide smoothly operating, visually acceptable installation.

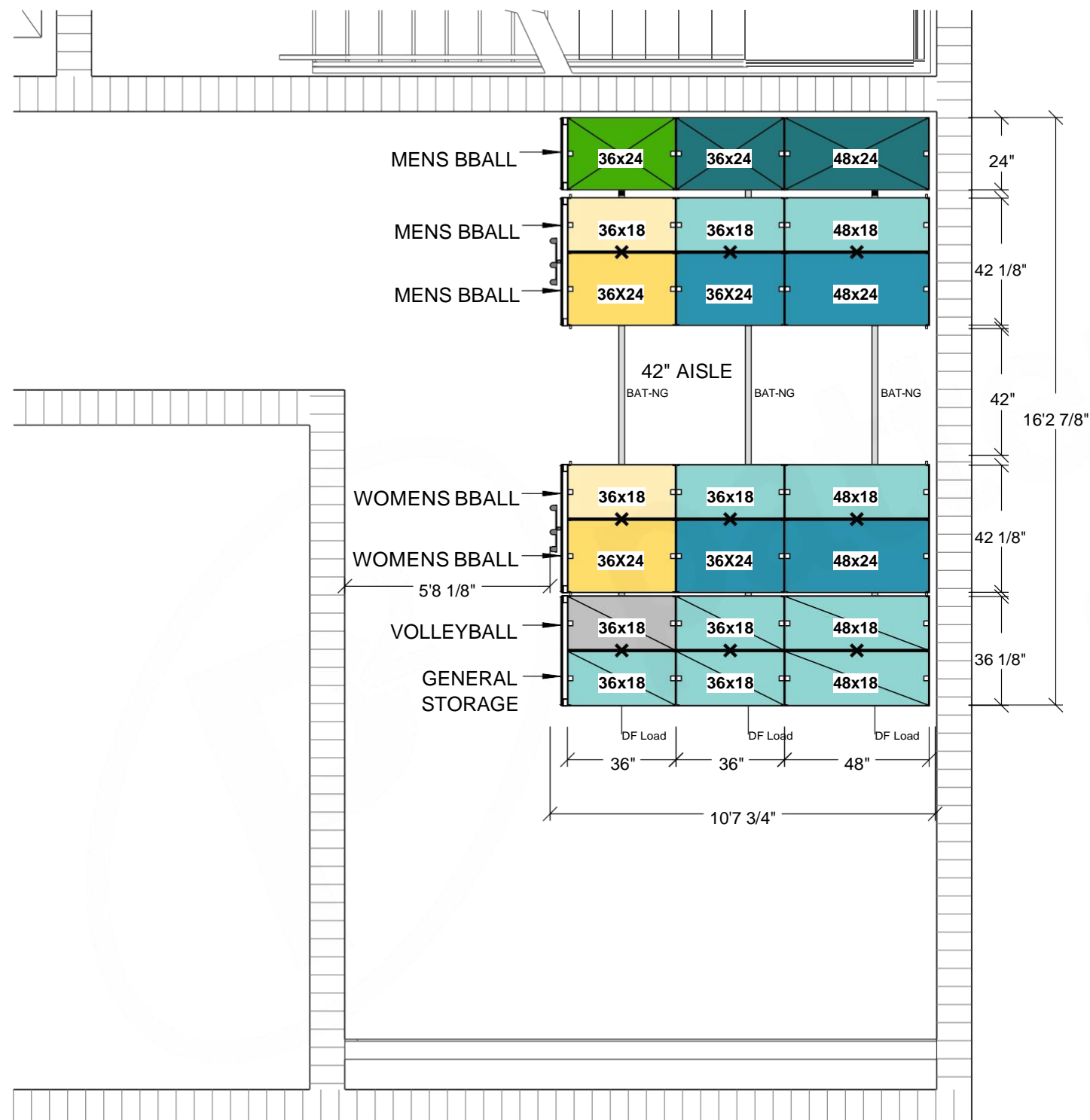
**205 CLEANING**

- A. Immediately upon completion of installation, clear components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

**206 DEMONSTRATION/TRAINING**

- A. Schedule and conduct demonstration of installed equipment and features with Owner's personnel.
- B. Schedule and conduct maintenance training with Owner's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.
- C. Protect system against damage during remainder of construction period. Advise Owner of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

**END OF SECTION**



System Weight Summary Report		
Total media weight	0.00 lbs	
Total equipment weight	4,994.56 lbs	
Total picklist weight	0.00 lbs	
Total aisle weight (15 lbs/ft <sup>2</sup> )	534.83 lbs	
Total system (media, equipment and aisle) weight	5,529.39 lbs	
Total Foot-Print area	165.85 ft <sup>2</sup>	
Total weight load per square foot (avg unit load)	33.34 lbs/ft <sup>2</sup>	
Maximum Deflection Allowed is:	L/700	
Weight load (line load*) under front rail	1,757.91 lbs	123.23 lbs/ft
Weight load (line load*) under rail no. 2	1,412.49 lbs	99.01 lbs/ft
Weight load (line load*) under back rail	1,321.89 lbs	92.66 lbs/ft
*Line Load calculations do not include weight of adjacent static shelving, floor, ramp, or aisles.		

**CURRENT LEAD TIME FOR PRODUCT AS DRAWN IS 11 WEEKS FROM ORDER DATE LEAD TIMES SUBJECT TO CHANGE**



Project Name: Fort Payne HS Gym Storage

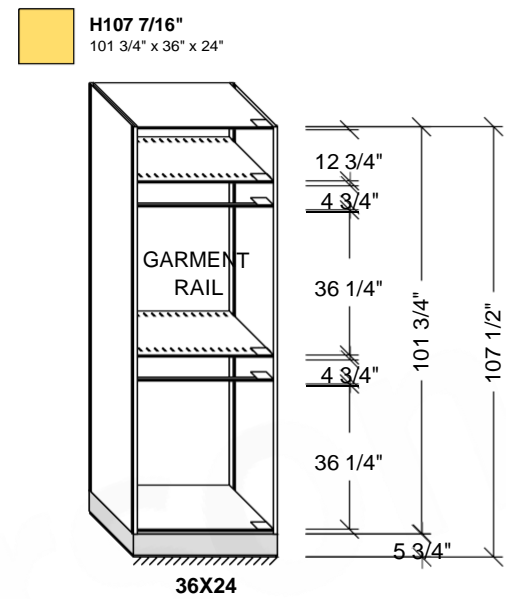
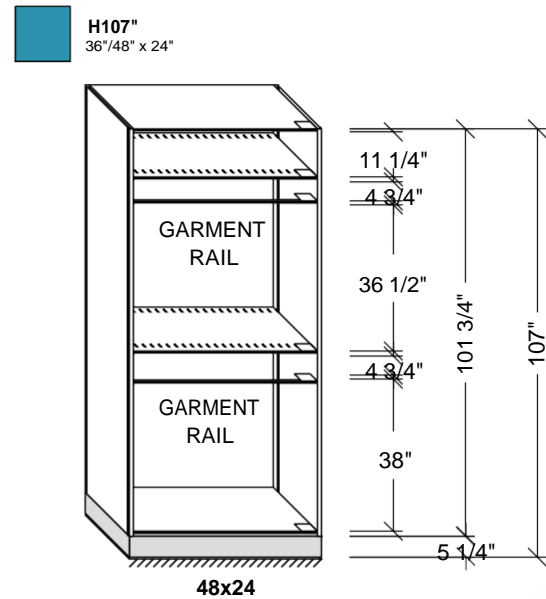
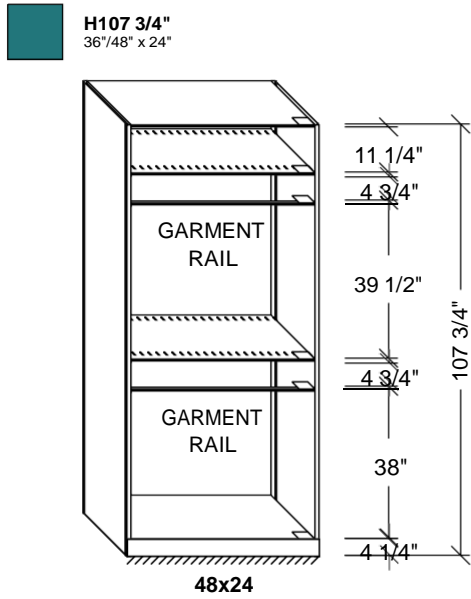
Salesperson:  
HAILS, MATTHEW

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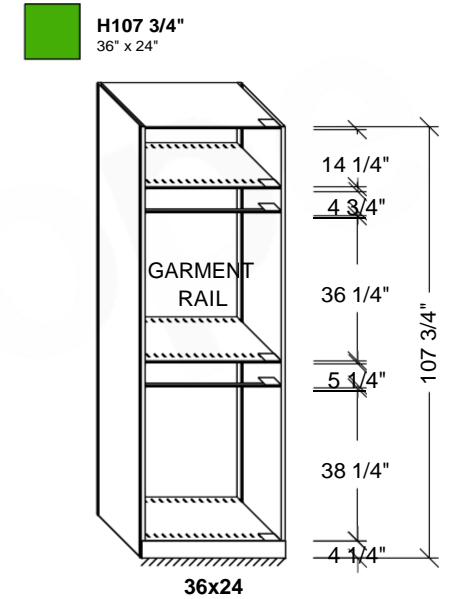
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Project #:  
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Drawn by:  
M. MULEY  
Date Printed:  
08/23/2024

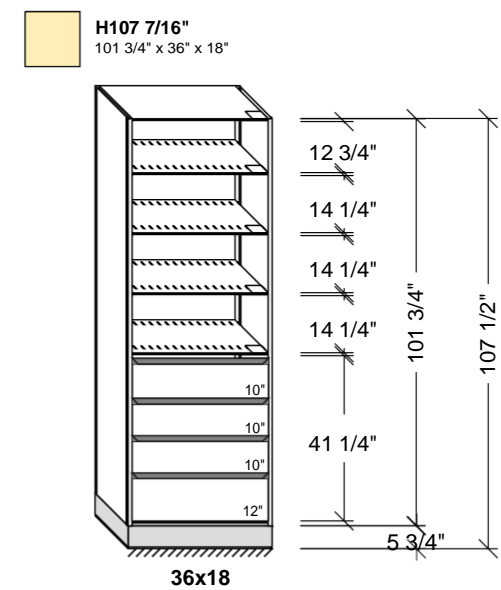
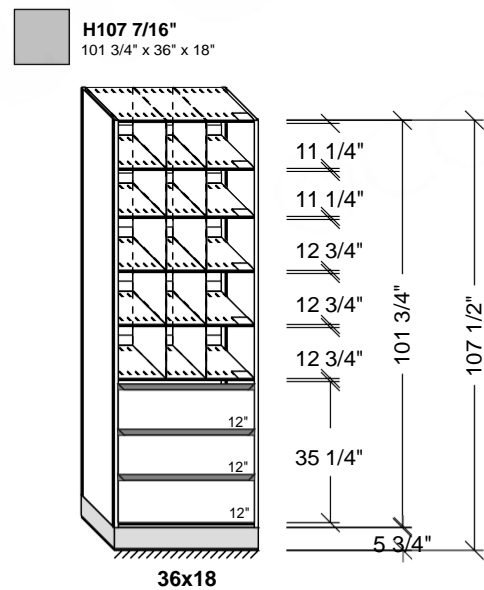
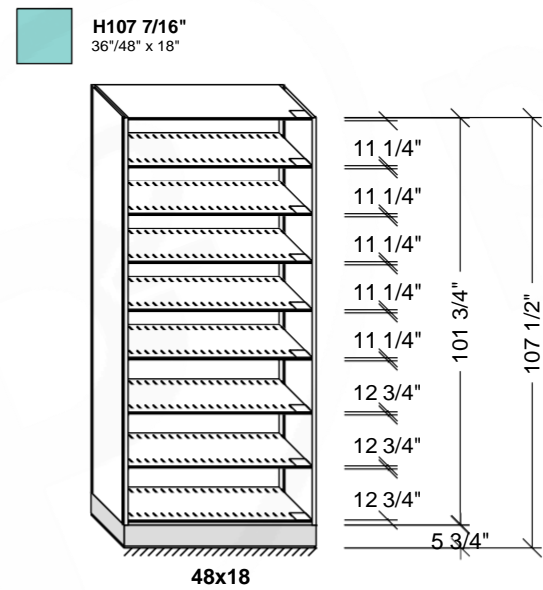
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Dated \_\_\_\_\_



FEATURING PLEXIGLASS WITH ELASTIC BANDS TO HOLD BALL IN PLACE



FEATURING PLEXIGLASS WITH ELASTIC BANDS TO HOLD BALL IN PLACE



CURRENT LEAD TIME FOR PRODUCT AS DRAWN IS 11 WEEKS FROM ORDER DATE LEAD TIMES SUBJECT TO CHANGE



Project Name: Fort Payne HS Gym Storage

Salesperson:  
HAILS, MATTHEW

Scale  
1/4" = 1'

Rev level:

Project #:  
344170

Drawn by:  
M. MULEY

Date Printed:  
08/23/2024

APPROVAL  
This drawing Approved By:

Dated \_\_\_\_\_

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**SECTION 10 7316  
METAL CANOPIES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Work in this section includes furnishing and installation of extruded aluminum canopy of the following types:
  - 1. Wall and Column Supported Type.
  - 2. Building Supported Type

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 3100 - Cast-in-Place Concrete.
- C. Section 04 2000 - Unit Masonry: Masonry work.
- D. Section 05 5000 - Metal Fabrications: Miscellaneous metals.
- E. Section 07 6200 - Sheet Metal Flashing and Trim: Sheet metal flashing.
- F. Section 07 9005 - Joint Sealers: Sealants.

**103 REFERENCE STANDARDS**

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.
- B. Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.A.
- C. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- D. American Architectural Manufacturer's Association (AAMA).
- E. American Society for Testing and Materials (ASTM).
- F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.
- G. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

**104 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

**105 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's product information, specifications and installation instructions for building components and accessories.
- C. Shop Drawings: Indicate all necessary plan dimensions, elevations and details. General Contractor shall verify all dimensions and provide elevations at each column, finish floor, and related soffit before releasing to manufacturer for fabrication.

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- D. Certification: Submit design calculations signed by a Registered Professional Engineer, licensed in Alabama. Design calculations shall state that the canopy system complies with the wind requirements of ASCE 7-95, the applicable building code, and all other governing criteria.
  - E. Certificate: Certify that products of this section meet or exceed specified requirements.
  - F. Warranty: Submit manufacturer's warranty (as described below) and ensure that forms have been completed in Owner's name and registered with manufacturer.

**106 QUALITY ASSURANCE**

- A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience, and approved by manufacturer.
- D. Wind Uplift: Provide roof and vertical panel systems including supports meeting requirements of Underwriters Laboratories, Inc. for wind uplift resistance as indicated in the Structural Drawings and as required by applicable Code.

**107 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store all canopy components in protected areas.

**108 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Canopy system, including materials and workmanship, shall be warranted from defects for a period of one year from substantial completion of installation.
- C. Provide 10 year manufacturer warranty for canopy system remaining intact (without perceptible deformation) and completely leak-free for 10-years from date of acceptance of project (this warranty need not cover damage from winds exceeding the velocities and/or loading required by the International Building Code).
- D. Provide 10 year manufacturer warranty covering finish of canopy when finished with fluoropolymer coating.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS**

- A. Wall and Column Supported Canopy System:
  - 1. Architectural Shade Products: [www.architecturalshade.com](http://www.architecturalshade.com).
  - 2. Superior Mason Products LLC: [www.superiormetalproducts.com](http://www.superiormetalproducts.com).
  - 3. Tennessee Valley Metals, Inc.: [www.tvmetals.com](http://www.tvmetals.com).
  - 4. Peachtree Protective Covers, Inc: [www.peachtreecovers.com](http://www.peachtreecovers.com)
  - 5. Substitutions: See Section 01 6000 - Product Requirements.

**202 MATERIALS**

- A. Structural Components (including but not limited to decking, beams, posts, fascia, channels, tubes, angles, mounting plates and hanger rods) shall be extruded aluminum, alloy 6063-T6.
- B. Fasteners: aluminum, 18-8 stainless steel or 300 series stainless steel.



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**203 COMPONENTS**

- A. Columns shall be radius-cornered tubular extrusion of size indicated (4" square minimum), with cutout and internal diverter for drainage where required.
- B. Beams shall be open-top tubular extrusion of size and shape indicated, top edges thickened for strength and designed to receive deck members in self-flashing manner. Provide structural ties in tops of all beams.
- C. Channels, Tubes, Angles, Hanger Rods, and Mounting Plates: Structural aluminum extrusions.
- D. Deck shall be extruded self-flashing sections interlocking into a composite unit.
- E. Fascia shall be size and shape as indicated.
- F. Flashing shall be .040" aluminum (min.).

**204 FABRICATION (COLUMN-SUPPORTED TYPE)**

- A. Columns and gutter beams shall be designed such that the columns will be notched to receive and secure the gutter beams.
- B. Support channels and beams shall be designed to receive and secure the gutter beams.
- C. Beams and Columns shall be positively connected with neatly mitered corners.
- D. Deck shall be manufactured of extruded modules that interlock in a self-flashing manner. Assemble deck with sufficient camber to offset dead load deflection.
- E. Concealed drainage: Water shall drain from covered surfaces into integral gutter beam and be directed to ground level discharge via one or more designated support posts.

**205 FABRICATION (WALL-SUPPORTED TYPE)**

- A. Canopy shall use perimeter extruded gutter and extruded decking.
- B. Framing System: Extruded T5 Aluminum.
- C. Support System: Prefinished galvanized steel tie rods, and other items indicated, or required for complete system.
- D. Exposed fasteners: Stainless steel

**206 FACTORY FINISHING**

- A. 70% Fluoropolymer (Kynar) finish: AAMA 2605, three coat.
- B. Color: Selected from manufacturer's full range of colors and manufacturer's custom colors.

**207 ACCESSORIES**

- A. Splash Pads: Precast concrete type, size and profiles indicated. (Standard profile, if not indicated.) minimum 3,000 psi at 28 days, with minimum 5 percent air entrainment.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify that substrates are ready to receive work.

**302 PREPARATION**

- A. Erection shall be performed after all concrete, masonry, and roofing work in the vicinity is complete and cleaned.
- B. Any blocking necessary to install wall supported canopy shall be in place and installed according to approved shop drawings prior to canopy installation. Accessories requirements to be coordinated with wind uplift requirements outlined in Paragraph, 1.06 Quality Assurance.

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**3.03 INSTALLATION**

- A. Installation shall be in strict accordance with manufacturer's recommendations and approved shop drawings.
- B. Blockouts, if required, shall be provided by manufacturer, and installed by General Contractor.
- C. Erect columns and beams true to line, level and plumb.
- D. All fasteners penetrating building face shall be sealed.
- E. Canopies shall be installed with slope of 1/8" per foot for water to drain from top of canopy to draining scuppers/downspouts and eliminate ponding.
- F. All exposed fasteners shall be painted to match canopy color.
- G. Decking shall be aligned and secured to aluminum frame structure.
- H. Install in accordance with manufacturer's instructions.
- I. Set splash pad under each downspout column outlet.

**3.04 TOLERANCES**

- A. Maximum Variation From True Position: 1/2".
- B. Maximum Offset From True Alignment: 1/4" in 10' - 0".

**3.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

**3.06 CLEANING**

- A. After installation, entire system shall be left in a clean condition.

**3.07 PROTECTION**

- A. Protect the finish during handling and erection.
- B. Take all precautions needed to protect entire canopy system from damage during subsequent construction activity until time of Substantial Completion.
- C. Do not permit traffic on canopy roof assemblies without approval of the canopy installer and manufacturer.

**3.08 MAINTENANCE**

- A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

**END OF SECTION**

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**SECTION 11 3013  
KITCHEN AND LAUNDRY EQUIPMENT**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Kitchen appliances.
- B. Kitchen appliances, Owner Furnished, Contractor Installed.
- C. Laundry appliances.

**102 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Division 15 Section for Plumbing Piping: Plumbing connections for appliances.
- C. Division 16 Section for Equipment Wiring: Electrical connections for appliances.

**103 REFERENCE STANDARDS**

- A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

**104 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**105 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.
- C. Gas Appliances: Bearing design certification seal of AGA.

**106 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

**PART 2 - PRODUCTS**

**201 KITCHEN APPLIANCES**

- A. All Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator (S7): Free-standing, french door, frost-free.
  - 1. Capacity: Total storage of 24.7 cubic ft.
  - 2. Features: Include glass shelves.
  - 3. Finish: Stainless steel.
  - 4. Width: 32-3/4 inches, maximum.
  - 5. Depth: 37-1/2 inches.
  - 6. Height: 69-7/8 inches.
  - 7. Location: See drawings.

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8. Manufacturer/Product: GE GNE25JYKFS
  9. Other Manufacturers:
    - a. Whirlpool Corp: [www.whirlpool.com](http://www.whirlpool.com)
    - b. Substitutions: See Section 01 6000 - Product Requirements.
  - C. Microwave, Commercial (S3): Countertop: Capacity: 0.8 cu.ft.; Power Rating: 1000 watts; Exterior Dimensions: 20-1/8"W x 16-1/2"D x 12"H; 6 minute dial timer.
    1. Door Finish: Stainless steel.
    2. Power Source: 120V, 60Hz, Single Phase.
    3. Finish and color: Satin Stainless Steel.
    4. Location: See Drawings.
    5. Manufacturers:
      - a. GE: [www.geappliances.com](http://www.geappliances.com).
      - b. Kenmore Appliances: [www.kenmore.com](http://www.kenmore.com).
      - c. Panasonic Commercial Microwave Oven Model NE-1022F [Basis of Design]: [www.panasonic.com](http://www.panasonic.com).
      - d. Whirlpool Corp.
  - D. Warming Drawer (S23): recessed
    1. Stainless Steel exterior.
    2. Size: 24"W x 23"D x 10"H.
    3. Location: See drawings.
    4. Manufacturer/Product: Whirlpool KOWT100E
    5. Other Manufacturers:
      - a. kitchenaid
      - b. viking
      - c. Substitutions: See Section 01600 - Product Requirements.

**202 LAUNDRY APPLIANCES**

- A. Commercial Clothes Washer (S1): Front-loading.
    1. Capacity: Approximately 2.8 cu. ft.
    2. ADA Compliant.
    3. Energy Star Qualified.
    4. Controls: Solid state electronic.
    5. Finish: Stainless Steel, color Satin stainless.
    6. Motor: Variable Speed Induction, 1 HP, 750 W.
    7. Cycle/Temp: Normal, Perm Press, Delicate/Hot, Warm/Cold.
    8. Size: Must match dryer. Approximately 43"H x 26-7/8"W x 28"D.
    9. Location: See drawings.
    10. Product: Speed Queen Quantum Commercial Front Load Washer; SFN--FSG 112TN01: [www.speedqueen.com/route](http://www.speedqueen.com/route).
    11. Other Manufacturers:
      - a. Continental Girbau: [www.continentalgirbau.com](http://www.continentalgirbau.com).
      - b. Maytag: [www.maytag.com](http://www.maytag.com).
      - c. Substitutions: See Section 01 6000 - Product Requirements.
  - B. Dryer (S4): Electric, stationary.
    1. Capacity: Approximately 7.0 cu. ft.
    2. ADA Compliant.
    3. Controls: Solid state electronic, with electronic moisture-sensing dry control.
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4. Temperature Selections: five.
  5. Features: Include end of cycle signal.
  6. Finish: Stainless Steel, color Satin Stainless.
  7. Drum: Galvanized Steel.
  8. Size: Must match dryer. Approximately 43"H x 26-7/8"W x 28"D.
  9. Location: See drawings.
  10. Product: Speed Queen Quantum Commercial Single Load Dryer; SDELYFGW171TN01:  
[www.speedqueen.com/route](http://www.speedqueen.com/route).
  11. Other Manufacturers:
    - a. Continental Girbau: [www.continentalgirbau.com](http://www.continentalgirbau.com).
    - b. Maytag: [www.maytag.com](http://www.maytag.com).
    - c. Substitutions: See Section 01 6000 - Product Requirements.

**PART 3 - EXECUTION**

**301 EXAMINATION**

- A. Verify utility rough-ins are present and correctly located.

**302 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

**303 ADJUSTING**

- A. Adjust operating equipment to efficient operation.

**304 CLEANING**

- A. Remove packing materials from equipment.
- B. Wash and clean equipment.

**END OF SECTION**

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**SECTION 11 6623  
GYMNASIUM EQUIPMENT**

**PART 1 - GENERAL**

**101 RELATED DOCUMENTS:**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**102 SUMMARY:**

- A. This Section includes the following gymnasium equipment:
  - 1. Basketball equipment, electrically and manually operated.
  - 2. Volleyball equipment, manually operated.
  - 3. Wall-mounted and post column safety pads.
  - 4. Judge's stand.
  - 5. Scoring table.
  - 6. Shot Clock.
  - 7. Center Ceiling Mounted Scoreboard
- B. Related Sections include the following:
  - 1. Division 3 Section "Concrete" for installation of floor insert sleeves, for oversized recessed voids to be cast in concrete floors, and for thickened slabs at these locations.
  - 2. Division 5 Sections "Metal Fabrications" and "Structural Steel" for structural supports not provided by gymnasium equipment manufacturer for supporting gymnasium equipment to building structure.
  - 3. Section 11 6653 - Gymnasium Divider Curtain.
  - 4. Section 11480 - Scoreboards.
  - 5. Division 26 - Electrical.
    - a. Manufacturer of electrical items in this Section shall coordinate junction box with switch plate in field.
- C. Products furnished, but not installed under this Section, include floor insert sleeves for inserts to be cast in concrete subfloors and footings.

**103 DEFINITIONS:**

- A. FIBA: International Basketball Federation (Federation Internationale de Basketball Amateur).
- B. FIVB: International Volleyball Federation (Federation Internationale de Volleyball).
- C. NAGWS: National Association for Girls and Women in Sport.
- D. NCAA: National Collegiate Athletic Association.
- E. NFHS: National Federation of State High School Associations.
- F. USAV: United States of America Volleyball (formerly, USVBA: U.S. Volleyball Association).

**104 PERFORMANCE REQUIREMENTS:**

- A. Seismic Performance: Provide basketball backstops capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads," whichever is more stringent.

**105 SUBMITTALS:**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include



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details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.

- B. Shop Drawings: Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
  - 1. Blocking and Reinforcement: Show locations of blocking and reinforcement required for support of gymnasium equipment.
  - 2. Setting Drawings: For cast-in floor insert sleeves for post standards.
  - 3. Design Calculations: Upon request, submit signed and sealed design calculations by a qualified professional engineer. Calculate requirements for supporting gymnasium equipment and for seismic restraint. Verify capacity of members and connections to support loads and verify loads, point reactions, and locations for attachment of gymnasium equipment to structure with those indicated on Drawings.
- C. Coordination Drawings: Court layout plans and elevations drawn to scale and coordinating oversized recesses for deferred installation of floor insert sleeves, and/or floor-insert penetrations, and game lines and markers applied to finished flooring.
- D. Samples for Initial Selection: For each type of gymnasium equipment indicated.
- E. Samples for Verification: For the following products:
  - 1. Pad Fabric: Not less than 3 inches (80 mm) square, with specified treatments applied. Mark face of material.
  - 2. Volleyball Floor Insert: Full size unit, which after review and acceptance, upon request, may be picked up by the Contractor for use in the project.
- F. Product Certificates: For each type of gymnasium equipment, signed by product manufacturer.
- G. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.
- H. Qualification Data: For installer and for professional engineer.
- I. Maintenance Data: For gymnasium equipment and gymnasium equipment operator to include in maintenance manuals.

**106 QUALITY ASSURANCE:**

- A. Installer Qualifications: A qualified installer employing workers trained and approved by manufacturer.
  - 1. Refer to Section 01 0150 - "Special Conditions", for additional information regarding minimum experience requirements.
- B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.
- C. Standards: Provide gymnasium equipment complying with or exceeding requirements of the Alabama High School Athletic Association, and the above referenced standards.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**107 PROJECT CONDITIONS:**

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity

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conditions are maintained at the levels indicated for Project when occupied for its intended use.

- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment. Verify dimensions by field measurements.

**108 COORDINATION:**

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

**109 WARRANTY:**

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Basketball backboard failures including glass breakage.
    - b. Faulty operation of basketball backstops.
    - c. Volleyball post standards and net tensioning system.
  2. Warranty Period:
    - a. Basketball equipment: 25 years from date of substantial completion.
    - b. Volleyball equipment: 10 years from date of substantial completion.

**PART 2 - PRODUCTS**

**201 MANUFACTURERS:**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Basketball Equipment:
    - a. AALCO.
    - b. AL, Inc.; ADP Lemco, Inc.
    - c. Arizona Courtlines.
    - d. Basketball Products International; American Athletic, Inc.
    - e. Bison Inc.
    - f. Draper.
    - g. Garner.
    - h. Institutional Products, Inc.
    - i. Jaypro Sports, Inc.
    - j. Performance Sports Systems, Inc.
    - k. Porter Athletic Equipment Co.
    - l. Spalding.
  2. Volleyball Equipment:
    - a. AALCO.
    - b. American Athletic, Inc.
    - c. Arizona Courtlines
    - d. Bison Inc.
    - e. Draper.
    - f. Garner.
    - g. Jaypro Sports, Inc.

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- h. Performance Sports Systems, Inc.
  - i. Porter Athletic Equipment Co.
  - j. Schelde North America.
  - k. Spalding.
  - l. Sports Imports, Inc.
3. Wall-Mounted and Post Column Safety Pads:
- a. AALCO.
  - b. AL, Inc.; ADP Lemco, Inc.
  - c. Alabama Contract Sales
  - d. American Athletic, Inc.
  - e. Arizona Courtlines
  - f. Draper
  - g. Garner
  - h. Institutional Products, Inc.
  - i. Jaypro Sports, Inc.
  - j. Performance Sports Systems, Inc.
  - k. Porter Athletic Equipment Co.
  - l. Spalding

**202 MATERIALS, GENERAL:**

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; mill finish or decorative, baked-enamel, powder-coat finish.
  - 1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
  - 2. Cast Aluminum: ASTM B 179.
- B. Steel: Comply with the following:
  - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, hot-dip galvanized.
  - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53.
  - 3. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless another grade is required by structural loads.
  - 4. Steel Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513 or steel tubing fabricated from steel complying with ASTM A 569/A 569M and complying with the dimensional tolerances in ASTM A 500.
  - 5. Malleable-Iron Castings: ASTM A 47 (ASTM A 47M 0, grade required by structural loads.
  - 6. Support Cable: 1/4-inch- (6-mm-) diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation.
  - 7. Support Chain: Proof coil chain, complying with ASTM A 413/A 413M, Grade 30, size and diameter as required by structural loads; plated or painted. Provide fittings complying with chain manufacturer's written recommendations for size, number, and method of installation.
- C. Particleboard: ANSI A208.1.
- D. Wood-Based, Structural-Use Panels: Comply with DOC PS 2; for plywood, comply with DOC PS 1.
- E. Equipment Mounting Pads: Wood, transparent painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's current written recommendations.
- F. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed tamperproof, vandal and theft resistant. Provide as required for

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gymnasium equipment assembly, mounting, and secure attachment.

- G. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

**203 BASKETBALL EQUIPMENT:**

- A. General: Provide equipment complying with requirements in the Alabama High School Athletic Association's and NFHS's Basketball Rule Books. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- B. Overhead-Supported Backstops: Complete assembly spanning height indicated on Drawings, including primary and secondary superstructure support framing to building structure, pipe and cable bracing, adjustable hangers, clamps, cables, chains, pulleys, fittings, hardware, and fasteners. Overhead backstop support shall be compatible with Folding Type listed below.
1. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
    - a. Center Mast: All welded construction with side sway bracing of pipe.
    - b. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; black.
  2. Folding Type: Provide manufacturer's standard assembly for side-folding backstop where indicated, with hardware and fittings to permit folding.
  3. Goal Height Adjuster: Adjustable from 8 to 10 feet (2.4 to 3 m) with crank mechanism, locking in any position within adjustment range, with visible height scale and finish matching framing.
  4. Operation: Electrically operated.
- C. Backstop/Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb (2722-kg) load capacity, unless higher capacity is recommended in writing by backstop manufacturer; Provide one per folding backstop.
1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; Provide one per folding backstop.
- D. Basketball Backboards: Provide predrilled holes or preset inserts for mounting goals.
1. Description: Rectangular, 72 by 42 inches (1800 by 1050 mm) width by height, fabricated from the following:
    - a. Glass: Not less than 1/2-inch- (12-mm-) thick, transparent tempered glass. Provide glass with impact-absorbing, resilient rubber or PVC gasket around perimeter in a fully welded brushed-natural-finish, heavy extruded-aluminum frame, with steel subframe, reinforcement, and bracing, including center-strut frame reinforcement, and with mounting slots for mounting backboard frame to backstop support framing.
    - b. Direct Mount: Designed for mounting backboard frame to center mast of backstop framing to maximize relief of stresses on backboard frame and glass.
  2. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
  3. Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
- E. Goal Mounting Assembly: Compatible with goal, backboard, and support framing.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass

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- backboard.
  - 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backstop support framing so no force, transmitted by ring, is directly applied to backboard and rigidity and stability of goal are maximized.
  - F. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
    - 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
    - 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
    - 3. Mount: Rear mount.
    - 4. Net Attachment: No-tie loops for attaching net to rim without tying.
    - 5. Finish: Manufacturer's standard factory-applied, electrostatic baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; orange.
  - G. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (400 to 450 mm long), official sized to fit rim diameter, and as follows:
    - 1. Competition Cord: Antiwhip, made from white nylon cord not less than 120 gm nor more than 144 gm thread.
  - H. Portable Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
    - 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
    - 2. Height: Adjustable to 8'-0", 9'-0", and 10'-0".
    - 3. Backstop Base Size: 4'-5-1/2" W x 6'-3-3/4" L (including padding)
    - 4. Base Features:
      - a. Non-marking, rubber tread caster wheels with roller bearings.
      - b. Auto-retract foot pad at front of base.
      - c. Docking tray floor anchor system.
      - d. Concealed handwheel mechanism with roller thrust bearing.
    - 5. Backboard shall include cutouts to provide a concealed raceway for shot clock.
    - 6. Shot clock support frame shall be made of unitized 3" diameter, 1/4" thick wall aluminum tubing.
  - I. Safety Pads: Provide safety pads, complying with referenced standards, designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.  
*For exterior use, provide manufacturer's standard outdoor usage crash pad.*
    - 1. Safety Pad Attachment: Bolt-on.
    - 2. Color: As selected by Architect from manufacturer's full range of fifteen (15) standard colors, minimum.
  - J. For motorized goals and other electrical equipment in this Section, Manufacturer shall coordinate junction box with switch plate in field.

**204 VOLLEYBALL EQUIPMENT:**

- A. General: Provide equipment complying with requirements in referenced standards.
- B. Floor Inserts: Chrome-finished steel floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to

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securely anchor pipe sleeve below finished floor in concrete with anchors designed for securing floor insert to floor substrate indicated; one per post standard.

1. Floor Plate: Lockable, manufacturer's standard hinged access cover, designed to be flush with adjacent flooring. Provide two tools for unlocking access covers.
- C. Post Standards: Removable, paired volleyball post standards as indicated on Drawings. Adjustable height. Designed for easy removal from permanently placed floor insert supports. Fabricated from steel and extruded-aluminum or manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
1. Nominal Pipe or Tubing Diameter: 3-1/2-inch (89 mm) OD at base.
  2. Net Height Adjuster: Manufacturer's standard mechanism for height adjustment, complete with fittings; designed for positioning net at heights indicated.
    - a. Net Heights: Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches (910 and 2430 mm) or more.
  3. Height Markers: Clearly marked at regulation play heights for elementary school, girls/women, boys/men, sitting volleyball, and tennis.
    - a. Include as minimum the following height markers for adult through youth: 7'-11-5/8", 7'-9-5/8", 7'-6", 7'-4-1/8", 7'-2-1/8", 7'-0", 6'-6", 6'-4", 6'-0", and 5'-0".
- D. Net: 32 feet (9.75 m) long, 39 inches tall, and as follows; 1 per pair of paired post standards:
1. Width and Mesh: 39 inches with 4-1/2-inch- (110-mm-) square mesh made of black polyester string.
    - a. Hem Band Edges: White, 2-inch- (50-mm-) wide top binding, black, 1-inch-
      - 1) (25-mm-) wide bottom and side bindings, tie offs at top and bottom of each side end of net, and 1/4-inch- (6-mm-) diameter rope, at least 42 feet (12.8 m) long, threaded through top hem of binding.
    - b. Top Line: Not less than 1/8-inch- (3-mm-) diameter, galvanized or coated steel cable.
    - c. Bottom Line: Not less than 1/8-inch- (3-mm-) diameter, galvanized or coated steel cable.
  2. Dowels: Not less than 1/2-inch- (12-mm-) diameter fiberglass or 1-inch- (25-mm-) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
- E. Net Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip worm-gear, rack-and-pinion type, or ratchet-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and removable handle. Mount net tensioner on post standard at side away from court play. Provide end post with post top pulley. Provide opposing post with welded steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- F. Safety Pads: Comply with NCAA and NFHS requirements. Provide pads consisting of not less than 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant manufacturer's standard polyurethane, or cross-linked or closed-cell polyethylene foam filler covered by puncture- and tear-resistant, not less than 14-oz. (397-g) PVC-coated polyester, or not less than 14-oz. (397-g) nylon-reinforced PVC fabric cover, treated with fungicide for mildew resistance, with fire-test-response characteristics indicated. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches (1830 mm); 1 per post.

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2. Net Lines: Four per net.
  3. Fabric Cover Flame-Resistance Ratings: Passes NFPA 701.
  4. Fabric Color: As selected by Architect and Owner from manufacturer's full range of standard color selections (15 minimum color options).
- G. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.
- H. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch- (910-mm-) wide or wider door openings. Fabricate units of welded steel tubing with heavy-duty casters, including not less than two swivel casters. Fabricate wheels from materials that will not damage or mark floors; number of units as required to provide transport and storage for specified equipment.
- I. Judge's Stand: Provide judge's stand which connects to volleyball net post standard. Provide with platform-support side frames, platform, ladder, handrail (extending 38" nominal above platform). Provide with lower end of ladder equipped with heavy-duty diameter, non-marking rubber pads. Side frames shall also be equipped with 3" diameter, non-marking caster wheels positioned for ease of tipping and transporting to storage area. Metal frames and ladder rungs shall be finished in durable powder-coated finish. Platform shall be coated with non-slip top surface. Top of platform shall be 3'-10" above playing surface while in use. Product shall be Porter No. 00999-000 Judge's Stand with Protective Padding Set, or approved equal, and shall be compatible with net post standard used.

**205 SAFETY PADS:**

- A. Wall Safety Pads in Gym as indicated on drawings: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric cover, free from sag and wrinkles and firmly attached to back of backer board.
1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick exterior-grade plywood, mat-formed, or composite panel.
  2. Fill: Multiple-impact-resistant foam not less than 2-inch- (50-mm-) thick bonded polyurethane foam, 6-lb (2.7-kg) density.
  3. Size: Each panel section, 24 inches (600 mm) wide by not less than 72 inches (1800 mm) long.
  4. Number of Panel Sections:
    - a. Not less than 40'-0" total length for Main and Side Court end pads, as indicated on the Drawings.
    - b. 2-sided pads flush-mounted against and installed directly on each outside building corner exposed around basketball courts when bleachers are retracted from open position (24-inches x 24-inches sections wrapping corners); and
    - c. 3-sided pads flush-mounted against and installed directly on each building column which protrudes from face of interior walls, following the contour and taper of columns up to the required 72-inch pad heights.
  5. Installation Method: Concealed mounting Z-clips, or manufacturer's standard mounting method, when acceptable to the Architect and Owner.
  6. Fabric Cover Colors: As selected by Architect and Owner from manufacturer's full range of colors, minimum fifteen (15) standard colors; Two colors may be selected.
- B. Wall Safety Pads at Covered Pavilion as indicated on drawings: Padded panels designed to wrap columns as indicated in the drawings. Each panel section consisting of polyurethane foam encased in at least 14 oz vinyl. Vinyl material panel sections should be sewn together, free from sag, wrinkles, and firmly attached to the column.

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1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick exterior-grade pressure treated plywood, mat-formed, or composite panel.
  2. Fill: Multiple-impact-resistant foam not less than 2-inch- (50-mm-) thick bonded polyurethane foam, 6-lb (2.7-kg) density.
  3. Size: As required to wrap columns as indicated in the Drawings.
  4. Installation Method: Concealed mounting Z-clips, or manufacturer's standard mounting method, when acceptable to the Architect and Owner.
  5. Fabric Cover Colors: As selected by Architect and Owner from manufacturer's full range of colors, minimum fifteen (15) standard colors; Two colors may be selected.

**206 SCORING TABLE**

- A. Provide scoring table in location indicated.
- B. Color: To be selected by Architect
- C. Size: 96-inches long x 31-inches high x 31-inches deep, nominal.
- D. Capable of folding to 16-inch width.
- E. Provide back-lit panels on front for school name and mascot, or advertising; illumination by recessed fluorescent tubes with polycarbonate covers to reduce glare onto court, covered with shatterproof lexan.
- F. Provide with non-marking wheels to protect gym floor.
- G. Provide with electronic possession/ bonus indicator panel.
- H. Manufacturer:
  1. Allied Scoring Tables: [www.alliedscoringtables.com](http://www.alliedscoringtables.com).
  2. GV Pro.: [www.gvprotables.com](http://www.gvprotables.com).
  3. Varsity Image: [www.varsityimage.com](http://www.varsityimage.com).
  4. Substitutions: See Section 01 6000 - Product Requirements.

**207 SHOT CLOCK**

- A. Provide 2 shot clocks per court indicated in the Drawings. Location to be se
- B. Color: To be selected by Architect from full range of manufacturer colors.
- C. Size: 26-inches long x 25-inches high x 6-inches deep, nominal.
- D. Provide with wireless play/shot clock remote controller.
- E. Provide with 15" LED digits.
- F. Manufacturer:
  1. Allied Scoring Tables: [www.alliedscoringtables.com](http://www.alliedscoringtables.com).
  2. GV Pro.: [www.gvprotables.com](http://www.gvprotables.com).
  3. Varsity Image: [www.varsityimage.com](http://www.varsityimage.com).
  4. Substitutions: See Section 01 6000 - Product Requirements.

**PART 3 - EXECUTION**

**301 EXAMINATION:**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance.
  1. Verify critical dimensions.
  2. Examine supporting structure and below finished floor for subfloors and footings.



3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**302 INSTALLATION, GENERAL:**

- A. General: Comply with manufacturer's current written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
  1. Floor Insert Locations: Coordinate location with application of game lines and markers.
  2. Floor Insert Elevations: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and type of floor plate.
  3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor Insert Setting: Grout sleeve for post standards in oversized, recessed voids in concrete slabs and footings. Clean holes of debris. Position sleeve and fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor and footing from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.
- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.

**303 ADJUSTING:**

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

**304 CLEANING AND PROTECTION:**

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure gymnasium equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

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**305 DEMONSTRATION:**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 1 Section "Project Closeout".

**END OF SECTION**

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**SECTION 12 2414  
ROLLER WINDOW SHADES**

**PART 1 - GENERAL**

**101 SECTION INCLUDES**

- A. Manually operated sunscreen roller shades.

**102 RELATED SECTIONS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 06 1000 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.
- C. Section 09 2116 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.
- D. Section 09 5100 - Suspended Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.
- E. Division 26 - Electrical: Electric service for motor controls.

**103 REFERENCES**

- A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

**104 SUBMITTALS**

- A. Submit under provisions of Section 01 3000.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
  - 3. Storage and handling requirements and recommendations.
  - 4. Mounting details and installation methods.
  - 5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

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- G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.
- B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
- E. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.
- F. Mock-Up: Provide a mock-up (for both manual and electrical shades) of one roller shade assembly for evaluation of mounting, appearance and accessories.
  - 1. Locate mock-up in window designated by Architect.
  - 2. Do not proceed with remaining work until, mock-up is accepted by Architect.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

**1.07 PROJECT CONDITIONS**

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

**1.08 WARRANTY**

- A. Shade Fabric: Manufacturer's 10-year warranty.
- B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.
- C. Roller Shade Hardware, and Chain: 5 years warranty against defects in materials and workmanship.
- D. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Caco, Inc.
- B. Draper, Inc.; "Access FlexShades" [Basis of Design]: [www.draperinc.com](http://www.draperinc.com).
- C. Lutron: [www.lutron.com](http://www.lutron.com).
- D. MechoShade Systems, Inc. [www.mechoshade.com](http://www.mechoshade.com).

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- E. Substitutions: Section 01 6000 - Product Requirements.

**202 SHADE CLOTH**

- A. Light-Filtering Fabrics:
1. SheerWeave Series SW2900 Series by Phifer: VOC Emissions: GREENGUARD and GREENGUARD Gold - certified as a low-emitting fabric. Composition: 38% Fiberglass, 62% Vinyl on Fiberglass. Fire rating: NFPA 101 (Class A Rating). Bacteria and Fungal Resistance: ASTM E 2180; ASTM G 21AATCC30 Part 3; ASTM D 3273; GREENGUARD Mold and Bacteria Standard ASTM 6329. Include Microban antimicrobial additives. Mesh Weight: 14.1 oz/sq yd. Openness Factor - Approx. 5 percent. UV Blockage - Approx. 95 Percent. Fabric thickness: 0.022 inches.
- B. Color and Pattern: As selected by Architect from manufacturer's standard range.

**203 MANUAL WINDOW SHADES**

- A. Type: Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation. Includes aluminum housing with installation to be coordinated with ceiling system installation. Provide brackets, fasteners, and other components necessary for complete installation.
- B. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
1. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon.
  2. Bead chain loop: Stainless steel bead chain hanging at side of window.
- C. Roller: Fabricated from extruded aluminum or steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade size. Provide with roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.
- D. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.
- E. Endcap covers to match fascia/headbox finish.
- F. Shade slat: Slat encased in heat seamed hem.
- G. Headbox Ceiling/Wall Style: Aluminum fabrication with removable closure, endcaps, and back and top cover piece:
1. Finish: Powder coat color as selected by Architect.
- H. Location: In Administrative Spaces. See Drawings.

**204 ACCESSORIES**

- A. Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings where indicated on the Drawings.
1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
    - a. Provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.

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- B. Fascia, where required for non-recessed mounting:
    - 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
    - 2. Fascia shall be able to be installed across two or more shade bands in one piece.
    - 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
    - 4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
    - 5. Notching of Fascia for manual chain shall not be acceptable.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

**3.03 INSTALLATION**

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

**3.04 TESTING AND DEMONSTRATION**

- A. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.
- B. Test motorized window shades to verify that controls, limit switches, interface to other building systems, and other operating components are functional. Correct deficiencies.
- C. Demonstrate operation of shades to Owner's designated representatives.

**3.05 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

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**SECTION 12 3219  
LAMINATE CASEWORK**

**PART 1 - GENERAL**

**101 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.

**102 WORK INCLUDED**

- A. The extent of manufactured casework systems as shown on drawings, schedules, and specified herein. Where specific materials, finishes, construction details, and hardware are specified herein, the casework contractor shall be held in strict accordance. All items shall be as provided, and publicly cataloged, by the manufacturers to assure physical and dimensional integrity of the system and ready access to additional systems components for a minimum of ten (10) years after completion of this contract. Product from companies not meeting this requirement will not be accepted. It is the intent of the owner and architect and construction manager to have this specification section furnished by one contractor.
- B. Furnish and install all fixed, modular, and mobile laminate clad casework, tops and accessories and components, fillers and related items shown on drawings and herein specified. All built-in and modular plastic laminate counter tops and splashes are specified herein and detailed on architectural.
- C. Furnish and install all locks for cabinet doors and drawers as indicated on elevations of the architectural drawings.

**103 RELATED WORK SPECIFIED ELSEWHERE**

- A. Division 6 - Coordination of all in-wall blocking.
- B. Sinks and service fixtures, service and waste lines and all connections, vents, electrical service fixtures, hoods and ducting within or adjacent to casework, or otherwise required in all areas except Science labs and Science classrooms: Furnished and installed under Mechanical and Electrical Divisions 21 through 26.
- C. Base molding: Furnished and installed under Finishes Division 9, to be consistent with base molding in room, unless base is not specified, in which case laminate base shall be applied.
- D. Appliances, unless specifically noted on plans as included in this section.
- E. Furnishing, installing and connecting of service supply lines and conduits within equipment and reagent racks, connecting of exposed service lines, connecting of services in tunnels or service turrets through, under, or along backs of working surfaces as required for utility service fixtures.
- F. Installing all utility service outlet accessory fittings and fixtures furnished by casework contractor, pulling of wire and connecting of electrical fixtures in service lines, provision of ground fault protection for circuits requiring such.
- G. Receiving, installing and connecting all separate sinks, cup sinks or drains, draining troughs, overflows and sink outlets, as furnished by the casework contractor for the Work Room and Storage Room areas.
- H. Furnishing, installing and connecting all traps, tailpieces, backflow prevention devices and special plumbing fittings and piping of unusual nature to meet local codes even though not specifically called for in specifications or shown on drawings.
- I. Furnishing and installing of all framing, bucks, metal grounds or reinforcements in walls, floors, ceilings to adequately support and anchor casework and related equipment.



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- J. Furnishing fluorescent tubes, light bulbs and any miscellaneous materials generally classified as maintenance or supply items.
  - K. Furnishing and installation of all rigid or flexible conduit, wire, pulling of wire, fittings, special electrical equipment, data, and accessories including boxes, receptacles, and flush plates required at reception desk.
  - L. Coordination with millwork items as specified in Section 06 4000 - "Architectural Woodwork".

**104 SYSTEM DESCRIPTION**

- A. All manufactured casework shall be pre-engineered, and cataloged in a nationally published catalog. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature; no exceptions will be allowed.

**105 QUALITY ASSURANCE**

- A. All manufactured casework systems, countertops and related items herein specified shall be furnished by one contractor to insure single source responsibility, and integration with other building trades
- B. All manufacturers herein listed, shall show evidence of a minimum of five (5) years experience in providing manufactured casework systems for similar types of projects.
- C. Manufacturer shall produce evidence of adequate facilities and personnel required to perform on this project. Financial stability of manufacturer shall be evidenced by readily providing a material performance bond if required.
- D. Manufactured casework systems must conform to design, quality of materials, workmanship and function as shown on drawings and specified herein. In the absence of a printed specification, minimum quality standards shall be in accordance with AWS, 2nd Edition, no exceptions will be permitted; additional requirements shall be as specified herein.
- E. Provide independent laboratory testing documenting that the support rail and interfacing components when tested in strict accordance with the requirements of seismic construction codes, all components met or exceeded the requirements as set forth by the codes. All casework bidders must provide a copy of test to architect ten days prior to bid date.
- F. All casework bidders must provide the following test results as tested by an independent testing firm:
  - 1. Racking Test (must exceed 975 lbs.)
  - 2. Front Joint Load Test (must exceed 635lbs.)
  - 3. Uniform Load Shelf Test (must exceed 1140 lbs.)
  - 4. Isolated Shelf Clip Load Test (must exceed 640 lbs.)
  - 5. Static Load Test ( must exceed 1800 lbs with no cabinet failure)
  - 6. Draw Side Joint Test (must exceed 425 lbs.)
  - 7. Draw Front Joint Test (must exceed 925lbs.)
  - 8. Draw Static Load Test (must exceed 900 lbs.)
- G. The architect and owner reserves the right to randomly select one 36" wide base cabinet and one 36" wide wall cabinet and one 36" wide tall cabinet from each manufacturer during installation and cut apart to determine if the product installed meets the written specification. The casework manufacturer shall include the price to replace these units in his bid. If the product fails to meet the specification then the casework supplier shall be responsible to make any and all necessary corrections.

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**106 SUBMITTALS**

- A. Product Data:
  - 1. In addition to the general conditions as relates to prior approvals, submittals of manufacturer's data, installation instructions, and samples are required upon architect's request.
- B. Samples:
  - 1. Submit samples of specified decorative laminate colors, patterns, and textures for exposed and semi-exposed materials for architect's selection. See drawings.
  - 2. Submit samples of hardware.
  - 3. Architect may request representative full-size samples for evaluation prior to approval. Samples may be impounded by architect/owner until completion of project to ensure compliance with specifications.
  - 4. Submit copy of Seismic testing report.
- C. Production Drawings:
  - 1. Submit production drawings for all casework systems and countertops and required equipment showing plans, elevations, ends, cross-sections, service run spaces and location of services.
  - 2. Include layout of units with relation to surrounding walls, doors, windows, and other building components. Include finish and hardware schedule.
  - 3. Coordinate production drawings with other work involved.

**107 PRODUCT HANDLING**

- A. Deliver casework and countertops only after wet operations in building are completed.
- B. Store completed casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.
- C. Protect finished surfaces from soiling and damage during handling and installation.
- D. General Contractor shall be responsible for protection of all casework and tops after installation is completed.

**108 JOB CONDITIONS**

- A. Humidity and Temperature Controls:
  - 1. Before the delivery and installation of casework and equipment, building conditions shall be as follows:
    - a. The building shall be secure and weather tight, with windows and doors installed, heat and air conditioning systems functional.
    - b. Walls and openings shall be plumb, straight and square. Concrete floors shall be level within acceptable trade tolerances. Specifically the floor must be within 1/8" of level per 10 foot run, non-accumulative, when tested with a straight edge in any one direction.
    - c. Flooring required to be placed under casework and equipment must be installed.
    - d. Wood or metal blocking (wall grounds) shall be installed within partitions prior to delivery of casework and furnishings to allow for immediate installation on delivery.
    - e. General Contractor shall have heat and air conditioning systems providing consistent temperature and humidity conditions as required Related humidity must be maintained at not less than 25%, nor more than 55%. Temperatures must not range lower than 65 degrees F, not to exceed 80 degrees F in areas of material installation.
    - f. All overhead mechanical, electrical or plumbing rough-in work shall be complete

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- g. Any "wet" operation performed by other trades must be complete prior to delivery.
  - h. Ceiling grids (with or without ceiling tiles), overhead soffits, duct work and lighting shall be installed.
  - i. Painting shall be complete.
  - j. General Contractor shall provide a secure storage area within the building that is clean, dry well ventilated, protected from direct sunlight and broom clean.

**109 WARRANTY**

- A. The manufacturer shall guarantee all materials and workmanship of equipment provided in this contract for a period of five years from date of final acceptance. This is a warranty of replacement and repair only, whereby the manufacturer will correct defects in materials and/or workmanship without charge. Any defective materials or faulty workmanship occurring within that time shall be replaced or corrected promptly without charge upon notification by the owner or his designated representative. All bidders are to provide to the Architect a copy of the manufacturers warranty for the casework ten (10) days before the bid date.

**PART 2 – PRODUCTS**

**201 PLASTIC LAMINATE CASEWORK**

- A. Manufacturers: Subject to compliance with specifications, provide products by one of the following:
  - 1. Casework Systems:
    - a. TMI Systems Design Corporation.
    - b. Case Systems, Inc.
    - c. LSI Corporation of America, Inc.
    - d. Stevens Industries, Inc.
  - 2. Plastic Laminate: Provide products from manufacturers listed on Finish Legend.
- B. Substitutions:
  - 1. It is the intent of this specification to establish performance and quality criteria consistent with pre-established standards of design and function herein described. Casework systems not meeting these minimum standards will not be accepted.
  - 2. Where specific materials, finish options, construction details, modularity, hardware and test data are specified herein, the casework storage system will be held in strict compliance. Substitutions will be considered prior to bid date provided request is submitted to the architect, in writing, no later than ten (10) days prior to bid date; substitution request shall list any and all deviations from this specification. Requests later than ten (10) days prior to bid will not be considered. Acceptable substitutions will be identified in future addenda.
  - 3. All manufacturers must submit the following items to the architect ten days prior to bid date to be qualified to bid.
    - a. A Copy of required Seismic Testing Data related to rail casework.
    - b. ADA Brochure depicting ADA requirements and compliance
    - c. All required independent test reports.
    - d. A sample base cabinet of fixed base cabinet with required hardware.
    - e. A copy of Guarantee and Limited Warranty.
    - f. A detailed deviation list addressing where the requested product deviates from the specified product.

**202 MATERIALS**

- A. Core Materials:

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1. MR Moisture Resistant Medium Density Fiberboard: Average 47-pound density grade, ANSI A 208.2.
  2. Medium Density Fiberboard: Average 47-pound density grade, ANSI A 208.2.
  3. Grade AB Plywood
- B. Hardboard: 1/4 inch thick prefinished hardboard, CS-251.
- C. Decorative Laminates:
1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-1995. for vertical surfaces.
  2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-1995 for horizontal Surfaces.
  3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-1995 for post formed tops.
  4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-1995.
  5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-1995.
  6. Thermally fused melamine laminate, NEMA Test LD 3-1995.
- D. Laminate Color Selection: See Finish Legend for color selection.
- E. Edging Materials:
1. 1 mm PVC banding.
  2. 3mm PVC banding, machine profiled to 1/8 inch radius, where required and herein specified.
  3. Finish: To be selected.
- F. Grommets:
1. 2-1/2" x 6" rectangle grommet - equal to Mocket #RG3-P3. See Drawings for location.

### **203 SPECIALTY ITEMS**

- A. Metal Parts:
1. Countertop support brackets, undercounter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted. Color shall be as selected by Architect from manufacturer's standard colors.
    - a. Support brackets shall be equal to Rakks EH Counter Support Bracket unless otherwise noted.
      - 1) For concealed support, provide Inside Wall-Flush Mount bracket.

### **204 CABINET HARDWARE**

- A. Hinges:
1. Furnish five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
  2. Doors 48 inch and over in height shall have 3 hinges per door.
  3. Provide a magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustments.
  4. 5-knuckle to be used at all classrooms and teaching spaces.
- B. 170-degree adjustable "CLIP System" concealed self-closing hinges as manufactured by Julius Blum, Inc., or equivalent by Grass or Stanley.
1. Doors 48 inch and over in height shall have 3 hinges per door.
  2. Concealed to be used at admin, public spaces, etc., where 5-knuckle not used.
- C. Pulls:

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1. Wire pulls equivalent to Stanley No. 4484, stainless steel, satin finish (ANSI B12012), 4-inches long, with 1-inch clearance; finish to match Section 08710 - "Finish Hardware" finish in room(s) where occurs. Pull design shall comply with the Americans with Disability Act (ADA).
- D. Drawer Slides:
1. Regular, knee space and pencil slides shall be 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and have a positive stop both directions with self-closing feature. Paper storage units shall have 150-pound load rated epoxy coated steel slides.
  2. File: Full extension, Shall have 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and have positive stop both directions with self-closing feature.
- E. Adjustable Shelf Supports:
1. Injection molded transparent polycarbonate friction shall fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support shall have 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall automatically adapt to 3/4 inch or 1 inch thick shelving and provide a non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds ( 300 pounds per support ) without failure.
- F. Locks:
1. Shall be standard removable core, disc tumbler, cam style lock for drawer with strike. Furnish 2 keys.
- G. Coat Rods: Shall be 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.
- H. File Suspension System: Shall be 14-gauge steel file suspension rails, epoxy powder coated. File followers, or other split bottom hardware, will not be acceptable.

## **205 FABRICATION**

- A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.
- B. Cabinet Body Construction:
1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals.
  2. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets.
  3. Tops, bottoms and sides of all cabinets are 3/4 inch thick particleboard core.
  4. Cabinet backs: 1/2 inch thick. Wall and tall cabinets are provided with a 1-inch x 1-3/4 inch PVC mounting strip used to secure the cabinet to the wall.
    - a. Exposed back on fixed or movable cabinets: 3/4 inch particleboard with the exterior surface finished in VGS laminate as selected.
    - b. Flexible rail mounted cabinet backs: 3/4 inch thick particleboard structurally doweled into cabinet sides and top panels.
  5. Fixed base and tall units have an individual factory-applied base, constructed of 3/4 inch exterior grade plywood. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawing.
  6. Base units, except sink base units: Full sub-top. Sink base units are provided with open top, a welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, a split back removable access panel.
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7. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
  8. Exposed and semi exposed edges.
    - a. Edging: 1mm PVC
  9. Adjustable shelf core: 1 inch thick particleboard up to 36 inches wide, 1-inch thick particleboard with corrugated metal ribbed stiffener for shelves over 36 inches wide.
    - a. Front edge: 1mm PVC.
  10. Interior finish, units with open Interiors:
    - a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with VGS High Pressure decorative laminate. Match exterior finish.
  11. Interior finish, units with closed Interiors:
    - a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back. Color to be selected by Architect.
  12. Exposed ends:
    - a. Faced with VGS high-pressure decorative laminate.
  13. Wall unit bottom
    - a. Faced with thermally fused melamine laminate.
  14. Wall and tall unit tops:
    - a. Top surface is faced with thermally fused melamine laminate.
  15. Balanced construction of all laminated panels is mandatory.
  16. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.
  17. Provide specified grommets in bracket supported countertops. 1 per 5'-0" of countertop. Locations to be determined by Architect.
- C. Drawers:
1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC. Full height sides.
  2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
  3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.
- D. Door/Drawer Fronts:
1. Core: 3/4 inch thick particleboard.
  2. Provide double doors in opening in excess of 24 inches wide.
  3. Faces:
    - a. Exterior: VGS High-pressure decorative laminate.
    - b. Interior: High-pressure cabinet liner CLS.
  4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.
- E. Miscellaneous Shelving: Location: Classroom storage closets.
1. Core material: 3/4 inch or 1 inch particleboard, as required.
  2. Exterior & Interior: VGS High-pressure decorative laminate.

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3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

**PART 3 - EXECUTION**

**3.01 INSPECTION**

- A. The casework contractor shall examine the job site and the conditions under which the work under this Section is to be performed, and notify the building Owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

**3.02 EXAMINATION**

- A. Verify existing conditions under provisions of Section 01 7000.
- B. Verify that openings are ready to receive work.
- C. Verify adequacy of support framing anchors.
- D. Verify that required utilities are available. In proper locations and ready for use.
- E. Beginning of installation means installer accepts existing surface conditions.

**3.03 INSTALLATION**

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit condition and substrate materials encountered.
- C. Set casework items plumb and square.
- D. Install casework attachment rails on wall along entire length of wall to facilitate installation of wall cabinets.
- E. Hang wall mounted casework on attachment rails. Level and adjust wall casework using adjustment capabilities of wall unit mounting brackets.
- F. Assemble and install worksurface tops on site with use of concealed screws on bases such as base cabinets, pedestals or columns
- G. Scribe to abutting surfaces and align adjoining components. Apply matching filler pieces where caseworks abuts dissimilar construction.
- H. Repair small scratches and surface blemishes on units using manufacturer's supplied touch up materials. Replace damaged cabinets or materials if directed by Architect.

**3.04 ADJUSTING**

- A. Adjust work under provisions of Section 01 7000.
- B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

**3.05 CLEANING**

- A. Clean work under provisions of Section 01 7000.
- B. Clean casework, counters, shelves, glass, legs, hardware, fittings, and fixtures.
- C. Remove dirt with damp cloth and soap and water. Remove stubborn dirt with non-flammable chlorinated solvents or solvents such as: lacquer thinner, M.E.K., or contact adhesive solvent if area is ventilated sufficiently to prevent build-up of fumes and noticeable odors. Do not use harsh abrasive cleaners.

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**306 PROTECTION OF FINISHED WORK**

- A. Protect finished work under provisions of Section 01 5000.
- B. Do not permit finished casework to be exposed to continued construction activity.
- C. Protect finished casework from damage by water, heat and other causes until final acceptance.
- D. Replace casework exhibiting warpage, surface discoloration, and damage at no additional cost to owner.

**END OF SECTION**



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**SECTION 14 2400  
MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS**

**PART 1 GENERAL**

**101 SUMMARY**

- A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
1. Standard pre-engineered hydraulic passenger elevators.
  2. Elevator car enclosures, hoistway entrances and signal equipment.
  3. Operation and control systems.
  4. Jack(s).
  5. Accessibility provisions for physically disabled persons.
  6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
  7. Materials and accessories as required to complete the elevator installation.
- B. Related Sections:
1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
  2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
  3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
  4. Division 5 Metals:
    - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
    - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
  5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
  6. Division 22 Plumbing
    - a. Sump pit and oil interceptor.
  7. Division 23 Heating, Ventilation and Air Conditioning
    - a. Heating and ventilating hoistways and/or control room.
  8. Division 26 Sections:
    - a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
    - b. Emergency power supply, transfer switch and auxiliary contacts.
    - c. Heat and smoke sensing devices.
    - d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
- C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.
1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
  2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for

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- placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
  4. Elevator hoistways shall have barricades, as required.
  5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
  6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
  7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
  8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
  9. All wire and conduit should run remote from the hoistways.
  10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
  11. Install and furnish finished flooring in elevator cab.
  12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
  13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
  14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
  15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
  16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
  17. General Contractor shall fill and grout around entrances, as required.
  18. All walls and sill supports must be plumb where openings occur.
  19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
  20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
  21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
  22. For signal systems and power operated door: provide ground and branch wiring circuits.
  23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
  24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.

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25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

**102 SUBMITTALS**

- A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.
- B. Shop drawings:
1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
  2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
  3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
  4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- E. Metal Finishes: Upon request, standard metal samples provided.
- F. Operation and maintenance data. Include the following:
1. Owner's manuals and wiring diagrams.
  2. Parts list, with recommended parts inventory.

**103 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
    - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
  2. The manufacturer shall have a documented, on-going quality assurance program.
  3. ISO-9001:2000 Manufacturer Certified
  4. ISO-14001:2004 Environmental Management System Certified
  5. LEED Gold certified elevator manufacturing facility.
- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- C. Regulatory Requirements:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
  2. Building Code: National.
  3. NFPA 70 National Electrical Code.
  4. NFPA 80 Fire Doors and Windows.
  5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
  6. Section 407 in ICC A117.1, when required by local authorities

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7. CAN/CSA C22.1 Canadian Electrical Code
  8. CAN/CSA B44 Safety Code for Elevators and Escalators.
  9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350
- D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).
- E. Inspection and testing:
1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
  2. Arrange for inspections and make required tests.
  3. Deliver to the Owner upon completion and acceptance of elevator work.
- F. Sustainable Product Qualifications:
1. Environmental Product Declaration:
    - a. GOOD: If Product Category Rules (PCR) are not available, produce a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
    - b. BEST: If Product Category Rules (PCR) are available, produce and publish an Environmental Product Declaration (EPD) based on a critically reviewed life-cycle assessment conforming to ISO 14044, with external verification recognized by the EPD program operator.
  2. Material Transparency:
    - a. GOOD: Provide Health Product Declaration at any level
    - b. BETTER: Provide Health Product Declaration (HPD v2 or later). Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-line tool.
    - c. BEST: Cradle to Cradle Material Health Certificate v3, Bronze level or higher.
  3. LEED v4 – Provide documentation for all Building Product Disclosure AND Optimization credits in LEED v4 for product specified.
  4. Living Building Challenge Projects: Provide Declare label for products specified.

**104 DELIVERY, STORAGE AND HANDLING**

- A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.
1. PROJECT CONDITIONS
- B. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

**105 WARRANTY**

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

**106 MAINTENANCE**

- A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during

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normal working hours excluding callbacks.

1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

## **PART 2 PRODUCTS**

### **201 MANUFACTURERS**

- A. Machine Room-less Hydraulic Elevator
  1. TK Elevator's endura Machine Room-Less Hydraulic Elevator [www.tkelevator.com](http://www.tkelevator.com) (Basis of Design)
  2. KONE. [www.kone.us](http://www.kone.us)
  3. OTIS. [www.otis.com](http://www.otis.com)
- B. Substitutions: Section 01 6000 – Product Requirements

### **202 MATERIALS, GENERAL**

- A. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.
- B. Steel:
  1. Shapes and bars: Carbon.
  2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
  3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture's standard selections.
- C. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture's standard selections.
- D. Flooring by others.

### **203 HOISTWAY EQUIPMENT**

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, round shaped, fastened to the building structure with steel brackets.
- D. Guides: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast

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iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed in a sealed steel casing having sufficient clearance space to allow for alignment during installation. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section.

- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)
- I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform "flooded pit operation", which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.
- J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also, a means for manual operation at the valve in the pit is required.

#### **2.04 POWER UNIT**

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
  - 1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
  - 2. An oil hydraulic pump.
  - 3. An electric motor.
  - 4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
- D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
  - 1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.

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2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
  3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
  4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
  5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
  6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
  7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
  8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

**205 HOISTWAY ENTRANCES**

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
  1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
  2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame.
  3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame.
- B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.
- C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details
- D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
  1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
  2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
  3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.



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**206 PASSENGER ELEVATOR CAR ENCLOSURE**

- A. Car Enclosure:
1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
  2. Reveals and frieze: a. Reveals and frieze: Stainless steel, no. 4 brushed finish
  3. Canopy: Cold-rolled steel with hinged exit.
  4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
  5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
  6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
    - a. Door Finish: Stainless steel panels: No. 4 brushed finish.
    - b. Cab Sills: Extruded aluminum, mill finish.
  7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
  8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
  9. Protection pads and buttons: Not required
- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

**207 DOOR OPERATION**

- A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer-based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
  2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
  3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered

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- before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
  5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
  6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
  7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
  8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red-light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

## **208 CAR OPERATING STATION**

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless-steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Auxiliary Operating Panel:
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
- E. Special Equipment: Not Applicable
- F. Digital Services: Cloud-based IoT monitoring system comes standard with these options:
  1. Remote Monitoring with Application Programming Interface (API) Integration
  2. ADA Phone - Code Compliant Cellular Connectivity
  3. A17.1 2019 Code - Enhanced Communications
  4. Smart Device Elevator Calling with occupant app API integration

## **209 CONTROL SYSTEMS**

- A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a

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NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

- B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
  - 1. Access to main control board and CPU
  - 2. Main controller diagnostics
  - 3. Main controller fuses
  - 4. Universal Interface Tool (UIT)
  - 5. Remote valve adjustment
  - 6. Electronic motor starter adjustment and diagnostics
  - 7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
  - 8. Operation of auxiliary pump/motor (secondary hydraulic power source)
  - 9. Operation of electrical assisted manual lowering
  - 10. Provide male plug to supply 110VAC into the controller
  - 11. Run/Stop button
- C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.
- E. Special Operation: Not Applicable
- F. Digital Services:
  - 1. Cloud-based IoT Monitoring System (standard): Contractor shall provide a cloud-based IoT (internet of things) monitoring system capable of tracking door movements and timing, trips, power cycles, car calls, out-of-service events and modes. This observation will continue 24/7 and it shall be capable of providing service technicians a minimum of three recommended solutions for defined failure events and automatically dispatch service technicians in the event of failure(s) while sending notifications to end users of changes in their equipment's state via both email and mobile device. Access to IoT and related equipment data and status will be made available in both a web portal and mobile application secured by password and username with at least two-factor authentication. Finally, this system must be self-contained and not require internet provision by others.
  - 2. Along with the monitoring system, options are available.
  - 3. Remote Monitoring with Application Programming Interface (API) Integration: Contractor shall provide a portal and mobile device application (app) that communicates relevant service and operational information such as elevator operational status, open service call tickets, call ticket history and performance and service history. This system shall provide a REST application programming interface (API) capable of transmitting relevant information from the cloud-based IoT monitoring system. This data includes equipment operational status, door movements, service and maintenance history, traffic statistics and failure

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- alerts.
4. ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.
  5. A17.1 2019 Code – Enhanced Communications: For jobs installed under enforcement of 2018 International Building Code or ASME A17.1-2019/CSA B44:19 Safety Code, contractor will provide a video camera necessary for viewing the elevator cab interior floor as well as a position indicator display in the cab operating panel capable of providing means of two-way, text-based communication when the emergency call button is engaged in the elevator car. These components, and associated cloud-based monitoring platform, will be non-proprietary in nature, allowing customization on where to direct emergency calls, while offering capability for any party to provide the emergency monitoring services.
  6. Smart Device Elevator Calling with Occupant app API Integration: Contractor will provide an elevator calling application for smart devices (app) that can be accessed through Android and IOS smart device operating systems. This calling service shall be accomplished on both, Destination Dispatch and Traditional ETA elevator control system applications. Furthermore, a single, common and consistent app shall have the same user experience and user interface on both Destination Dispatch and Traditional ETA dispatching control systems. To enable mobile calling functionality without creating unnecessary wear on elevator components resulting from false calls, proximity detection beacons shall be installed in the elevator lobby at each floor. These beacons shall detect user smart devices and restrict calling of elevators when the user is not within a pre-configured range of elevator entrance. Beacon-based proximity detection distance must be configurable to accommodate various building and floor layouts. Once Bluetooth signal is detected, the user can place a floor call directly from their handheld or wearable device. The elevator calling app shall remove the need for interaction with hall fixtures, buttons or kiosks. This system shall be capable of placing an automatic call to a user-configured destination floor automatically based on both location in building (floor) and time of day. App users shall be able to configure their own source or starting floor, destination floor and schedule of automatic calling service, and be able to configure multiple automatic calling services and routines. System shall have reasonable ability to auto-provision users from access control system and not require duplicate entry of users for access control purposes. Finally, all services above shall be made available via an application programming interface (API) so that a 3rd party or tenant occupant app could be integrated with elevator smart device calling service so that users could receive multiple occupant experience-based services in a single, common, 3rd party mobile device application (app).

## **2.10 HALL STATIONS**

- A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All fixtures shall be vandal resistant type.
  1. Provide one pushbutton riser with faceplates having a brushed stainless-steel finish.

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- a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
  - B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
  - C. Hall Position Indicator: Not Applicable
  - D. Hall lanterns: Not Applicable
  - E. Special Equipment: Not Applicable

**2.11 MISCELLANEOUS ELEVATOR COMPONENTS**

- A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.
- B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.
- C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

**PART 3 EXECUTION**

**301 EXAMINATION**

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

**302 INSTALLATION**

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
  - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
  - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
- C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

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- F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
  - G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
  - H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
  - I. Lubricate operating parts of system, where recommended by manufacturer.

**303 FIELD QUALITY CONTROL**

- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

**304 ADJUSTING**

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

**305 CLEANING**

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
  - 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

**306 PROTECTION**

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

**DEMONSTRATION**

- A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.
- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

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**402 ELEVATOR SCHEDULE**

- A. Elevator (Basis of Design):
1. Elevator Model: endura MRL Twinpost
  2. Elevator Type: Hydraulic Machine Room-Less, Passenger
  3. Rated Capacity: 4000 lbs.
  4. Rated Speed: 150 ft./min.
  5. Operation System: TAC32H
  6. Travel: 18'-0"
  7. Landings: 2 total
  8. Openings:
    - a. Front: 2
    - b. Rear: 0
  9. Clear Car Inside: 7'-8" wide x 5'-5" deep
  10. Inside clear height: 7'-4" standard
  11. Door clear height: 7'-0" standard
  12. Hoistway Entrance Size: 3'-6" wide x 7'-0" high
  13. Door Type: Per drawings
  14. Power Characteristics: Per drawings
  15. Seismic Requirements: Zone
  16. Hoistway Dimensions: 9'-4" wide x 6'-11" deep
  17. Pit Depth: 4'-0"
  18. Button & Fixture Style: Vandal Resistant Signal Fixtures
  19. Special Operations: None
  20. Digital Services:
  21. Remote Monitoring with Application Programming Interface (API) Integration
  22. ADA Phone - Code Compliant Cellular Connectivity
  23. A17.1 2019 Code - Enhanced Communications
  24. Smart Device Elevator Calling with occupant app API integration

**END OF SECTION**

**SEALS PAGE**

**PART 1 - GENERAL**

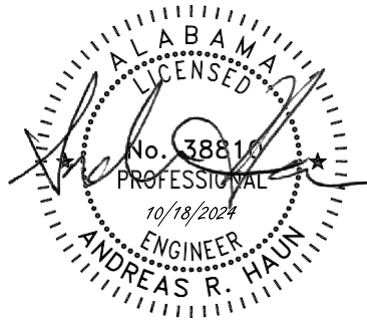
**1.1 DESIGN PROFESSIONALS OF RECORD**

A. Mechanical, Electrical, and Plumbing Engineer:

Rocket MEP  
PO Box 127 Gurley, Alabama 35748  
(256) 203-6373

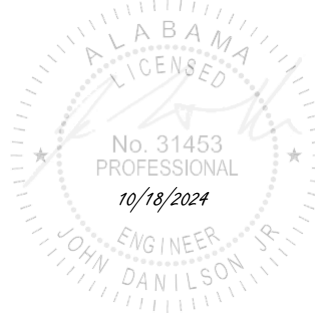
1. Division 23 Engineer of Record

Andreas R. Haun, PE  
License No. PE38810



2. Division 26 Engineer of Record

John T. Danilson, Jr. PE  
License No. PE31453



**END OF SECTION**



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**SECTION 21 05 00**

**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Above ground piping.
- B. Buried piping.
- C. Escutcheons.
- D. Mechanical couplings.
- E. Pipe hangers and supports.
- F. Pipe sleeves.
- G. Piping specialties.
- H. Pressure gauges.
- I. Pressure relief valves.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

**1.3 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- C. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- E. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- F. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- G. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- H. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- I. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
- J. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.
- K. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

- L. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.
- M. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- N. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.
- O. AWWA C606 - Grooved and Shouldered Joints; 2022.
- P. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Q. NFPA 1963 - Standard for Fire Hose Connections; 2019.
- R. UL (DIR) - Online Certifications Directory; Current Edition.
- S. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.
- T. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

#### **1.4 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
- B. Operation and Maintenance Data: Include installation instructions and spare parts lists.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section.
  - 1. Minimum three years experience.
- B. Comply with UL (DIR) requirements.
- C. Valves: Bear UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- E. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

#### **1.7 WARRANTY**

- A. Correct defective Work within a five year period after Date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.1 GENERAL REQUIREMENTS**

- A. Sprinkler-based System:
  - 1. Comply with NFPA 13.
  - 2. See Section 21 13 00.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

## 2.2 BURIED PIPING

- A. Ductile Iron Pipe: AWWA C151/A21.51.
  - 1. Fittings: AWWA C110/A21.10, standard thickness.
  - 2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
  - 3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

## 2.3 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 40, black.
  - 1. Steel Fittings: ASME B16.5 steel flanges and fittings.
  - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

## 2.4 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
- B. Clearances:
  - 1. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
  - 2. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

## 2.5 ESCUTCHEONS

- A. Material:
  - 1. Metals and Finish: Comply with ASME A112.18.1.
- B. Construction:
  - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
  - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

## 2.6 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.

## 2.7 MECHANICAL COUPLINGS

- A. Rigid Mechanical Couplings for Grooved Joints:
  - 1. Dimensions and Testing: Comply with AWWA C606.
  - 2. Minimum Working Pressure: 300 psig.
  - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
  - 4. Housing Coating: Factory applied orange enamel.

5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

## 2.8 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
  1. Activate electric alarm.
  2. Test and drain valve.
  3. Replaceable internal components without removing valve from installed position.
- B. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- C. Commercial Riser Manifold: Preassembled and tested riser manifold in accordance with NFPA 13.
- D. Electric Alarm: Electrically operated chrome-plated gong with pressure alarm switch.
- E. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.
- F. Fire Department Connections:
  1. Type: Free standing made of corrosion-resistant metal complying with UL 405.
    - a. Inlets: Two-way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or authority having jurisdiction. Brass caps with gaskets, chains, and lugs.
    - b. Rated Working Pressure: 175 psi.
    - c. Finish: Chrome.
    - d. Sleeve: Brass, 18-inch height.
    - e. Signage: Raised or engraved lettering 1 inch, minimum, indicating system type.

## 2.9 PRESSURE GAUGES

- A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
  1. Case: Steel with brass bourdon tube.
  2. Diameter: 4-1/2 inch.
  3. Mid-Scale Accuracy: One percent.
  4. Scale: Display in psi.

## 2.10 PRESSURE RELIEF VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

### 3.2 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.

- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
- G. Pipe Hangers and Supports:
  - 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 2. Place hangers within 12 inches of each horizontal elbow.
  - 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  - 2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
  - 3. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
- K. Escutcheons:
  - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
  - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
  - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

### 3.3 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

### END OF SECTION

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## SECTION 21 05 23

### GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Two-piece ball valves with indicators.
- B. Iron butterfly valves with indicators.
- C. Check valves.
- D. Iron OS&Y gate valves.
- E. Indicator posts.
- F. Trim and drain valves.

##### 1.2 RELATED REQUIREMENTS

- A. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.
- B. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.
- C. Section 21 13 00 - Fire-Suppression Sprinkler Systems.
- D. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.
- E. Section 28 46 00 - Fire Detection and Alarm.

##### 1.3 ABBREVIATIONS AND ACRONYMS

- A. EPDM: Ethylene-propylene diene monomer.
- B. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- C. NRS: Non-rising stem.
- D. OS&Y: Outside screw and yoke.
- E. PTFE: Polytetrafluoroethylene.
- F. SBR: Styrene-butadiene rubber.

##### 1.4 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- D. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2023.
- E. AWWA C606 - Grooved and Shouldered Joints; 2022.
- F. FM (AG) - FM Approval Guide; Current Edition.
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.



- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.

### 1.5 SUBMITTALS

- A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

### 1.6 QUALITY ASSURANCE

- A. Where listed products are specified, provide products listed, classified, and labeled by UL (DIR) or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads and flange faces.
  - 3. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors and maintain at higher than ambient dew point temperature.
    - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
  - 1. Use sling to handle large valves, rigged to avoid damage to exposed parts.
  - 2. Do not use operating handles or stems as lifting or rigging points.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
  - 1. Main Level: HAMV - Fire Main Equipment.
    - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
    - b. Level 1: HLOT - Valves.
    - c. Level 3: HLUG - Ball Valves, System Control.
    - d. Level 3: HLXS - Butterfly Valves.
    - e. Level 3: HMER - Check Valves.
    - f. Level 3: HMRZ - Gate Valves.
  - 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
    - a. Level 1: VQGU - Valves, Trim, and Drain.
- B. ASME Compliance:
  - 1. ASME B16.1 for flanges on iron valves.
  - 2. ASME B1.20.1 for threads on threaded-end valves.

- C. Comply with AWWA C606 for grooved-end connections.
- D. Comply with NFPA 13 for valves.
- E. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
  - 2. Handwheel: For other than quarter-turn trim and drain valves.
  - 3. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

## **2.2 TWO-PIECE BALL VALVES WITH INDICATORS**

- A. Description:
  - 1. Minimum Pressure Rating: 175 psig.
  - 2. Body Design: Two piece.
  - 3. Body Material: Forged brass or bronze.
  - 4. Port Size: Full or standard.
  - 5. Seat: PTFE.
  - 6. Stem: Bronze or stainless steel.
  - 7. Ball: Chrome-plated brass.
  - 8. Actuator: Worm gear or traveling nut.
  - 9. End Connections for Valves 1 NPS through 2 NPS: Threaded ends.

## **2.3 IRON BUTTERFLY VALVES WITH INDICATORS**

- A. Minimum Pressure Rating: 175 psig.
- B. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
- C. Seat: EPDM.
- D. Stem: Stainless steel.
- E. Disc: Ductile iron, nickel plated.
- F. Actuator: Worm gear or traveling nut.
- G. Supervisory Switch: Internal or external.
- H. Body Design: Grooved-end connections.

## **2.4 CHECK VALVES**

- A. Minimum Pressure Rating: 175 psig.
- B. Type: Center guided check valve.
- C. Body Material: Cast iron, ductile iron.
- D. Center guided check with elastomeric seal.
- E. Hinge Spring: Stainless steel.
- F. End Connections: Flanged, grooved, or threaded.

## **2.5 IRON OS&Y GATE VALVES**

- A. Listed and Body Marked: AWWA C509, FM (AG), and UL 262.
- B. End Connections: Flanged.

- C. Maximum Working Pressure: 175 psi.
- D. Working Temperature: 32 to 175 degrees F.
- E. Body and Bonnet Material: Cast or ductile iron.
- F. Wedge: Cast or ductile iron, or bronze.
- G. Stem: Brass, bronze, or stainless steel.
- H. Packing: Non-asbestos PTFE.
- I. Supervisory Switch: External.

## 2.6 INDICATOR POSTS

- A. Type: Underground.
- B. Base Barrel Material: Cast or ductile iron.
- C. Cap: Cast or ductile iron.
- D. Operation: Wrench.

## 2.7 TRIM AND DRAIN VALVES

- A. Ball Valves:
  - 1. Description:
    - a. Pressure Rating: 175 psig.
    - b. Body Design: Two piece.
    - c. Body Material: Forged brass or bronze.
    - d. Port Size: Full or standard.
    - e. Seat: PTFE.
    - f. Stem: Bronze or stainless steel.
    - g. Ball: Chrome-plated brass.
    - h. Actuator: Hand-lever.
    - i. End Connections for Valves 1 NPS through 2-1/2 NPS: Threaded ends.
- B. Angle Valves:
  - 1. Description:
    - a. Pressure Rating: 175 psig.
    - b. Body Material: Brass or bronze.
    - c. Ends: Threaded.
    - d. Stem: Bronze.
    - e. Disc: Bronze.
    - f. Packing: Asbestos free.
    - g. Handwheel: Malleable iron, bronze, or aluminum.
- C. Globe Valves:
  - 1. Description:
    - a. Pressure Rating: 175 psig.
    - b. Body Material: Bronze with integral seat and screw-in bonnet.
    - c. Ends: Threaded.
    - d. Stem: Bronze.
    - e. Disc Holder and Nut: Bronze.
    - f. Disc Seat: Nitrile.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron, bronze, or aluminum.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage.
  - 1. Check bolting for proper size, length, and material.
  - 2. Verify gasket for size, defects, damage, and suitable material composition for service.
  - 3. Replace all defective valves with new valves.

#### **3.2 INSTALLATION**

- A. Comply with specific valve installation requirements and application in the following Sections:
  - 1. Section 21 13 00 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
- C. Install check valve in water supply connections and backflow preventer at potable water supply connections.
- D. Valves in horizontal piping installed with stem at or above the pipe center.
- E. Position valves to allow full stem movement.
- F. Install valve tags.

**END OF SECTION**

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**SECTION 21 13 00**

**FIRE-SUPPRESSION SPRINKLER SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.
- C. Fire department connections.

**1.2 RELATED REQUIREMENTS**

- A. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.
- B. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.
- D. Section 28 46 00 - Fire Detection and Alarm.

**1.3 REFERENCE STANDARDS**

- A. ITS (DIR) - Directory of Listed Products; Current Edition.
- B. NFPA 1963 - Standard for Fire Hose Connections; 2019.
- C. UL (DIR) - Online Certifications Directory; Current Edition.
- D. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
  - 2. Sprinkler Wrenches: For each sprinkler type.
- D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

**1.5 QUALITY ASSURANCE**

- A. Comply with UL (DIR) requirements.
- B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Equipment and Components: Provide products that bear UL (DIR) label or marking.

- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
  - 1. Anvil International: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  - 2. Tyco Fire Protection Products: [www.tyco-fire.com/#sle](http://www.tyco-fire.com/#sle).
  - 3. Viking Corporation: [www.vikinggroupinc.com/#sle](http://www.vikinggroupinc.com/#sle).

### 2.2 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light hazard, unless noted otherwise; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Interface system with building fire and smoke alarm system.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

### 2.3 SPRINKLERS

- A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Extended.
  - 3. Finish: Chrome plated.
  - 4. Escutcheon Plate Finish: Chrome plated.
  - 5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- B. Exposed Area Type: Pendant type with guard.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Extended.
  - 3. Finish: Chrome plated.
  - 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Extended.
  - 3. Finish: Chrome plated.
  - 4. Escutcheon Plate Finish: Chrome plated.
  - 5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- D. Guards: Finish to match sprinkler finish.
- E. Flexible Drop System: Stainless steel, multiple use, open gate type.
  - 1. Application: Use to properly locate sprinkler heads.
  - 2. Include all supports and bracing.
  - 3. Provide braided type tube as required for the application.
  - 4. Manufacturers:
    - a. FlexHead Industries, a brand of Anvil International: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
    - b. Victaulic Company: [www.victaulic.com/#sle](http://www.victaulic.com/#sle).

## 2.4 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
  - 1. Activate electric alarm.
  - 2. Test and drain valve.
  - 3. Replaceable internal components without removing valve from installed position.
- B. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- C. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.
- D. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- E. Fire Department Connections:
  - 1. Type: Free standing made of corrosion resistant metal complying with UL 405.
    - a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
    - b. Rated Working Pressure: 175 psi.
    - c. Finish: Chrome.
    - d. Sleeve: Brass, 18 inches height.
    - e. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.
- D. Provide approved backflow preventer assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Locate outside alarm gong on building wall as indicated.
- G. Place pipe runs to minimize obstruction to other work.
- H. Place piping in concealed spaces above finished ceilings.
- I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- J. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- K. Flush entire piping system of foreign matter.
- L. Install guards on sprinklers where indicated.
- M. Hydrostatically test entire system.
- N. Require test be witnessed by Fire Marshal.



### **3.2 INTERFACE WITH OTHER PRODUCTS**

- A. Ensure required devices are installed and connected as required to fire alarm system.

**END OF SECTION**

**SECTION 22 05 29**

**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 2 PRODUCTS**

**1.1 GENERAL REQUIREMENTS**

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
  - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
  - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

**END OF SECTION**

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**SECTION 22 07 19**

**PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Jacketing and accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

**1.3 REFERENCE STANDARDS**

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).
- C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

**1.6 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## **PART 2 PRODUCTS**

### **2.1 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### **2.2 GLASS FIBER INSULATION**

- A. Manufacturers:
  - 1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 3. Knauf Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum Service Temperature: 850 degrees F.
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:
  - 1. Cloth: Untreated; 9 oz/sq yd weight.
  - 2. Blanket: 1.0 pcf density.
  - 3. Weave: 5 by 5.
- H. Indoor Vapor Barrier Finish:
  - 1. Cloth: Untreated; 9 oz/sq yd weight.
  - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- I. Insulating Cement: ASTM C449.

### **2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Manufacturers:
  - 1. Aeroflex USA: [www.aeroflexusa.com/#sle](http://www.aeroflexusa.com/#sle).
  - 2. Armacell LLC: [www.armacell.us/#sle](http://www.armacell.us/#sle).
  - 3. K-Flex USA LLC: [www.kflexusa.com/#sle](http://www.kflexusa.com/#sle).
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - 1. Minimum Service Temperature: Minus 40 degrees F.
  - 2. Maximum Service Temperature: 220 degrees F.
  - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

### **2.4 JACKETING AND ACCESSORIES**

- A. PVC Plastic Jacket:
  - 1. Manufacturers:
    - a. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

- a. Minimum Service Temperature: 0 degrees F.
  - b. Maximum Service Temperature: 150 degrees F.
  - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
  - d. Thickness: 10 mil, 0.010 inch.
  - e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
  1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. Glass fiber insulated pipes conveying fluids above ambient temperature:
  1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- G. Inserts and Shields:
  1. Application: Piping 1-1/2 inches diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert Location: Between support shield and piping and under the finish jacket.
  4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.
- I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

- J. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

**END OF SECTION**

**SECTION 22 10 05**

**PLUMBING PIPING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Sanitary waste piping, buried within 5 feet of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet of building.
- D. Domestic water piping, above grade.
- E. Natural gas piping, buried within 5 feet of building.
- F. Natural gas piping, above grade.
- G. Pipe flanges, unions, and couplings.
- H. Pipe hangers and supports.
- I. Ball valves.
- J. Butterfly valves.
- K. Flow-balancing valves.
- L. Pressure reducing valves.
- M. Pressure-temperature valves.
- N. Strainers.

**1.2 RELATED REQUIREMENTS**

- A. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- B. Section 22 07 19 - Plumbing Piping Insulation.

**1.3 REFERENCE STANDARDS**

- A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2019.
- B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- F. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
- G. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
- H. ASME B31.1 - Power Piping; 2022.
- I. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.



- J. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.
- K. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- L. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
- M. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
- N. ASTM B32 - Standard Specification for Solder Metal; 2020.
- O. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- P. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- Q. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
- R. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- S. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- T. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- U. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.
- V. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.
- W. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.
- X. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.
- Y. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.
- Z. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- AA. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2024.
- BB. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2024.
- CC. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- DD. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- EE. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.
- FF. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.
- GG. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- HH. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

- II. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- JJ. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- KK. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- LL. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- MM. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

#### **1.4 SUBMITTALS**

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

#### **1.5 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.7 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

### **PART 2 PRODUCTS**

#### **2.1 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

#### **2.2 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A74 service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

### 2.3 SANITARY WASTE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B306, DWV.
  - 1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
  - 2. Joints: ASTM B32, alloy Sn50 solder.
- C. PVC Pipe: ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

### 2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
- B. Ductile Iron Pipe: AWWA C151/A21.51.
  - 1. Fittings: Ductile or gray iron, standard thickness.
  - 2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

### 2.5 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
  - 1. PPI TR-4 Pressure Design Basis:
    - a. 160 psig at maximum 73 degrees F.
    - b. 100 psig at maximum 180 degrees F.
  - 2. Fittings: Brass and copper.
  - 3. Joints: Mechanical compression fittings.

### 2.6 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
  - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: ASME B31.1, welded.
  - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
- B. Flexible Gas Piping:
  - 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
  - 2. Fittings: Provided by piping system manufacturer.

### 2.7 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: Threaded or welded to ASME B31.1.
- B. Flexible Gas Piping:
  - 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
  - 2. Comply with ASTM E84.
  - 3. Fittings: Provided by piping system manufacturer.

### 2.8 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 2 inch and Under:
-

1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 2 inch:
  1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- C. No-Hub Couplings:
  1. Testing: In accordance with ASTM C1277 and CISPI 310.
  2. Gasket Material: Neoprene complying with ASTM C564.
  3. Band Material: Stainless steel.
  4. Eyelet Material: Stainless steel.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.9 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
  4. Wall Support for Pipe Sizes 4 inch and Over: Welded steel bracket and wrought steel clamp.
- C. Plumbing Piping - Water:
  1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes Up to 3 inch: Cast iron hook.
  4. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

## 2.10 BALL VALVES

- A. Manufacturers:
  1. Anvil International: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  2. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  3. Grinnell Products: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
  4. Nibco, Inc: [www.nibco.com/#sle](http://www.nibco.com/#sle).
- B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

## 2.11 FLOW-BALANCING VALVES

- A. Manufacturers:
  1. Anvil International: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  2. Griswold Controls: [www.griswoldcontrols.com/#sle](http://www.griswoldcontrols.com/#sle).
  3. ITT Bell & Gossett: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  4. Taco, Inc: [www.taco-hvac.com/#sle](http://www.taco-hvac.com/#sle).
- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet.

- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## 2.12 PRESSURE REDUCING VALVES

- A. Manufacturers:
  - 1. Amtrol Inc: [www.amtrol.com/#sle](http://www.amtrol.com/#sle).
  - 2. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  - 3. Watts Regulator Company: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  - 4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. 2 inch and Smaller:
  - 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
  - 2. Pressure Reducing Pilot-Operator:
    - a. Operating Range: 5 to 50 psi.
    - b. Connected into brass or bronze pilot piping and fittings.
    - c. Fixed flow restrictor, pressure gauges, and isolation valves.
- C. 2 inch and Larger:
  - 1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
  - 2. Pressure Reducing Pilot-Operator:
    - a. Operating Range: 5 to 50 psi.
    - b. Connected into brass or bronze pilot piping and fittings.
    - c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

## 2.13 PRESSURE-TEMPERATURE VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

## 2.14 STRAINERS

- A. Manufacturers:
  - 1. Armstrong International, Inc: [www.armstronginternational.com/#sle](http://www.armstronginternational.com/#sle).
- B. Size 1/2 inch to 3 inch:
  - 1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi, 250 deg F WOG service.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### 3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- K. Install bell and spigot pipe with bell end upstream.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- N. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- O. Sleeve pipes passing through partitions, walls, and floors.
- P. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
- Q. Pipe Hangers and Supports:
  - 1. Support horizontal piping as indicated.
  - 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 3. Place hangers within 12 inches of each horizontal elbow.
  - 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
  - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 7. Provide copper plated hangers and supports for copper piping.
  - 8. Support cast iron drainage piping at every joint.
- R. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### 3.4 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.
- E. Provide flow controls in water recirculating systems where indicated.

### 3.5 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.6 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
  - 1. Perform hydrostatic testing for leakage prior to system disinfection.
  - 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
  - 3. General:
    - a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
- C. Gas Distribution Systems:
  - 1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
  - 2. General Systems:
    - a. Inject a minimum of 10 psi of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
    - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound.
  - 3. Welded Pipes or Systems with Service Pressures Above 14 in-wc:
    - a. Inject a minimum of 60 psi of compressed air into the piping system for a duration of 30 minutes and verify with a gauge that no perceptible pressure drop is measured.
    - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound with 1 psi increments.
- D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

### 3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

### 3.8 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
  - 1. Provide 18 gauge, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

### 3.9 SCHEDULES

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inch to 1-1/4 inch:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inch to 2 inch:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.
    - c. Pipe Size: 2-1/2 inch to 3 inch:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 1/2 inch.
    - d. Pipe Size: 4 inch to 6 inch:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 5/8 inch.
  - 2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum Hanger Spacing: 6 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.

**END OF SECTION**



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**SECTION 22 10 06**  
**PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Drains.
- B. Cleanouts.
- C. Hydrants.
- D. Washing machine outlet boxes.
- E. Ice maker outlet boxes.
- F. Backflow preventers.
- G. Water hammer arrestors.
- H. Electronic trap-seal primers.

**1.2 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 30 00 - Plumbing Equipment.

**1.3 REFERENCE STANDARDS**

- A. ASME A112.6.3 - Floor Drains; 2022.
- B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
- C. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
- D. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- E. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- F. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- G. PDI-WH 201 - Water Hammer Arresters; 2017.

**1.4 SUBMITTALS**

- A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Loose Keys for Outside Hose Bibbs: One.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

## **PART 2 PRODUCTS**

### **2.1 GENERAL REQUIREMENTS**

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

### **2.2 DRAINS**

- A. Manufacturers:
1. Josam Company: [www.josam.com/#sle](http://www.josam.com/#sle).
  2. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  3. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  4. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
- B. Roof Drains:
1. Assembly: ASME A112.6.4.
  2. Body: Lacquered cast iron with sump.
  3. Strainer: Removable polyethylene dome with vandal proof screws.
  4. Accessories: Coordinate with roofing type:
    - a. Membrane flange and membrane clamp with integral gravel stop.
    - b. Adjustable under deck clamp.
    - c. Adjustable extension sleeve for roof insulation.
- C. Roof Overflow Drains:
1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 3.5 inches above flood elevation.
- D. Downspout Nozzles:
1. Bronze round with straight bottom section.
- E. Floor Drains:
- F. Floor Drain (FD-1):
1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- G. Floor Drain (FD-2):
1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel- bronze strainer with removable perforated sediment bucket.

### **2.3 CLEANOUTS**

- A. Manufacturers:
1. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
  2. Josam Company: [www.josam.com/#sle](http://www.josam.com/#sle).
  3. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Cleanouts at Exterior Surfaced Areas (CO-1):
1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Interior Finished Floor Areas (CO-3):
1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- D. Cleanouts at Interior Finished Wall Areas (CO-4):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

## 2.4 HYDRANTS

- A. Manufacturers:
  1. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
  2. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Wall Hydrants:
  1. ASSE 1019, freeze resistant, self-draining, hose thread spout, and integral vacuum breaker.
    - a. Installation: Lockable recessed box.
    - b. Finish: Polished chrome.
    - c. Operation: Operating key.
- C. Roof Hydrants:
  1. Freeze resistant, self-draining, hose thread spout, operating key, and integral vacuum breaker.
    - a. Finish: Polished nickel bronze.

## 2.5 WASHING MACHINE OUTLET BOXES

- A. Manufacturers:
  1. IPS Corporation/Water-Tite: [www.ipscorp.com/#sle](http://www.ipscorp.com/#sle).
  2. Oatey Supply Chain Services, Inc: [www.oatey.com/#sle](http://www.oatey.com/#sle).
  3. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Description: Plastic preformed rough-in box with brass quarter-turn ball valves or single lever-handle valves, socket for 2 inch waste, and slip-in finishing cover.
- C. Accessories:
  1. Water-hammer arrestors.

## 2.6 ICE MAKER OUTLET BOXES

- A. Manufacturers:
  1. IPS Corporation/Water-Tite: [www.ipscorp.com/#sle](http://www.ipscorp.com/#sle).
  2. Oatey Supply Chain Services, Inc: [www.oatey.com/#sle](http://www.oatey.com/#sle).
  3. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Description: Plastic preformed square rough-in box with brass quarter-turn ball valve, and slip-in finishing cover.
- C. Accessories:
  1. Water-hammer arrestors.

## 2.7 BACKFLOW PREVENTERS

- A. Manufacturers:
  1. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  2. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  3. Watts Regulator Company, a part of Watts Water Technologies: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Reduced Pressure Backflow Preventer Assembly:
  1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.

2. Maximum Working Parameters: 175 psi at 180 degrees F.
3. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.

## **2.8 WATER HAMMER ARRESTORS**

- A. Manufacturers:
  1. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
  2. Watts Regulator Company, a part of Watts Water Technologies: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  3. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Water Hammer Arrestors:
  1. Copper construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

## **2.9 ELECTRONIC TRAP-SEAL PRIMERS**

- A. Manufacturers:
  1. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  2. Precision Plumbing Products: [www.pppinc.net/#sle](http://www.pppinc.net/#sle).
- B. Description: Enclosed electronic trap seal primer system with timer.
- C. Electrical Characteristics:
  1. 120 volts, single phase, 60 Hz.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or water closets.

### **END OF SECTION**

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## SECTION 22 14 29

### SUMP PUMPS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Submersible sump pumps.

##### 1.2 REFERENCE STANDARDS

- A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL (DIR) - Online Certifications Directory; Current Edition.

##### 1.3 SUBMITTALS

- A. Product Data: Provide certified pump chart or curve with duty point marked over.
- B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- C. Executed warranty.

##### 1.4 QUALITY ASSURANCE

- A. Certifications: UL (DIR) listed, classified, and suitable for the purpose specified and indicated.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

##### 1.6 WARRANTY

- A. Manufacturer Warranty: Provide 2-year manufacturer warranty for pumps and related components. Complete forms in Owner's name and register with manufacturer.
- B. Submit warranty with related forms completed in Owner's name and registered with manufacturer.

#### PART 2 PRODUCTS

##### 2.1 SUBMERSIBLE SUMP PUMPS

- A. Manufacturers:
    - 1. Grundfos Pumps Corporation: [www.grundfos.com/#sle](http://www.grundfos.com/#sle).
    - 2. PROFLO: [www.ferguson.com/#sle](http://www.ferguson.com/#sle).
    - 3. Zoeller Company; \_\_\_\_\_: [www.zoeller.com/#sle](http://www.zoeller.com/#sle).
    - 4. Industrial Flow Solutions: [www.flowsolutions.com/#sle](http://www.flowsolutions.com/#sle).
  - B. General: Rugged stainless steel and cast iron housing and base with oil-filled motor chamber, ball bearings, and mechanical seal.
  - C. Impeller: Bronze; open nonclog, stainless steel shaft.
  - D. Motor: Base mount, enclosed, lubricated oil-free, thermal-overload protected, continuous duty, permanent split capacitor with oil-resistant, three-prong connector, 10 foot power cord.
-

- E. Controls: Integral, chemically-resistant, vertical plated-steel rod float switch. Cycle pump Off/On between 2.5 and 9 inch heights from bottom of pump.
- F. Solids Handling Capacity: Pass lint and other small solids up to 1/2 inch in size.
- G. Discharge Pipe Size: 2 inch, NPT, female.
- H. Maximum Water-Based Effluent Temperature: 120 degrees F.
- I. Accessories: Provide full flow swing-type discharge check valve.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install products with related fittings and accessories according to manufacturer instructions.
- B. Observe and provide incidentals required to complete installation in compliance with ICC (IPC).

#### **3.2 FIELD QUALITY CONTROL**

- A. Operational Tests: Conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

#### **3.3 PROTECTION**

- A. Protect installed products from damage from subsequent construction operations.

### **END OF SECTION**



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**SECTION 22 30 00**  
**PLUMBING EQUIPMENT**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Commercial electric water heaters.
- B. Diaphragm-type compression tanks.
- C. In-line circulator pumps.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

**1.3 REFERENCE STANDARDS**

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.
- C. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Provide electrical characteristics and connection requirements.
- B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.5 QUALITY ASSURANCE**

- A. Certifications:
  - 1. Water Heaters: NSF approved.
  - 2. Electric Water Heaters: UL listed and labeled to UL 174.
  - 3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

**1.7 WARRANTY**

- A. Manufacturer Warranty: Provide 5-year manufacturer warranty for domestic water heaters. Complete forms in Owner's name and register with manufacturer.

## **PART 2 PRODUCTS**

### **2.1 WATER HEATERS**

- A. Manufacturers:
  - 1. A.O. Smith Water Products Co: [www.hotwater.com/#sle](http://www.hotwater.com/#sle).
  - 2. Bradford White Corporation: [www.bradfordwhite.com/#sle](http://www.bradfordwhite.com/#sle).
  - 3. Rheem Manufacturing Company: [www.rheem.com/#sle](http://www.rheem.com/#sle).
- B. Commercial Electric Water Heaters:
  - 1. Type: Factory-assembled and wired, electric, vertical storage.
  - 2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
  - 3. Tank: Glass lined welded steel; thermally insulated with minimum 2 inches foam plastic encased in corrosion-resistant steel jacket; baked-on enamel finish.
  - 4. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
  - 5. Accessories:
    - a. Water Connections: Brass.
    - b. Anode: Magnesium.
    - c. Temperature and Pressure Relief Valve: ASME labeled.
  - 6. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in.

### **2.2 DIAPHRAGM-TYPE COMPRESSION TANKS**

- A. Manufacturers:
  - 1. Amtrol Inc: [www.amtrol.com/#sle](http://www.amtrol.com/#sle).
  - 2. Bell & Gossett, a brand of Xylem, Inc: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  - 3. Taco, Inc: [www.taco-hvac.com/#sle](http://www.taco-hvac.com/#sle).
- B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
- C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

### **2.3 IN-LINE CIRCULATOR PUMPS**

- A. Manufacturers:
  - 1. Armstrong Fluid Technology: [www.armstrongfluidtechnology.com/#sle](http://www.armstrongfluidtechnology.com/#sle).
  - 2. Bell & Gossett, a brand of Xylem, Inc: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  - 3. A.O. Smith: [www.hotwater.com/#sle](http://www.hotwater.com/#sle).
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.

- B. Electrical Work: Provide automatic control and protective devices with associated wiring to interconnect related interfaced devices required for specified operation.
- C. Coordinate system, equipment, and piping work with applicable electrical, gas, vent, drain, and waste support interconnections as included or provided by other trades.
- D. Domestic Water Storage Tanks:
  - 1. Provide steel pipe support, independent of building structural framing members.
  - 2. Clean and flush prior to delivery to site. Seal until pipe connections are made.
- E. Pumps:
  - 1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
  - 2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

**END OF SECTION**

**SECTION 22 40 00**  
**PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Flush valve water closets.
- B. Wall hung urinals.
- C. Lavatories.
- D. Wall-hung, solid surface, multistation lavatory units.
- E. Sinks.
- F. Under-lavatory pipe supply covers.
- G. Shower receptors.
- H. Showers.
- I. Bi-level, electric water coolers.
- J. Mop sinks.
- K. Service sinks.

**1.2 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 10 06 - Plumbing Piping Specialties.
- C. Section 22 30 00 - Plumbing Equipment.

**1.3 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- D. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
- E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).
- F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.
- G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- I. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.
- J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- M. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- N. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- O. UL (DIR) - Online Certifications Directory; Current Edition.

#### **1.4 SUBMITTALS**

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on-site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

#### **1.6 WARRANTY**

- A. Provide five year manufacturer warranty for electric water cooler.

### **PART 2 PRODUCTS**

#### **2.1 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Maximum Fixture or Faucet Supply Pressure: 60 psi unless stated otherwise.

#### **2.2 REGULATORY REQUIREMENTS**

- A. Comply with applicable codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.

#### **2.3 FLUSH VALVE WATER CLOSETS**

- A. Water Closets:
  - 1. Vitreous china, ASME A112.19.2, floor mounted and wall hung, siphon jet flush action, china bolt caps.
  - 2. Bowl: ASME A112.19.2; 15 inches (18 inches ADA) high with elongated rim.
  - 3. Flush Valve: Exposed (top spud).
  - 4. Flush Operation: Sensor operated.
  - 5. Handle Height: 44 inches or less.
  - 6. Trapway Outlet: 4 inch.
  - 7. Color: White.
  - 8. Manufacturers:
    - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
    - c. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).

- d. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - e. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
- B. Flush Valves:
- 1. Valve Supply Size: 1 inch.
  - 2. Valve Outlet Size: 1-1/2 inches.
  - 3. Manufacturers:
    - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
    - c. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - d. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 4. Sensor-Operated:
    - a. Type: ASME A112.19.5; chloramine-resistant clog-resistant dual-seat diaphragm valve complete with vacuum breaker, stops and accessories.
    - b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with battery powered infrared sensor, and mechanical override or override push button.
    - c. Supplied Volume Capacity: 1.2 gal per flush.
  - 5. Exposed Type: Chrome-plated, escutcheon, integral screwdriver stop.
- C. Toilet Seats:
- 1. Manufacturers:
    - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Bemis Manufacturing Company: [www.bemismfg.com/#sle](http://www.bemismfg.com/#sle).
    - c. Church Seat Company: [www.churchseats.com/#sle](http://www.churchseats.com/#sle).
    - d. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 2. Plastic: Solid, white finish, elongated shape, open front, slow-closing hinged seat cover, extended back complete with self-sustaining hinges, and brass bolts with covers.
- D. Water Closet Carriers:
- 1. Manufacturers:
    - a. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
    - b. JOSAM Company: [www.josam.com/#sle](http://www.josam.com/#sle).
    - c. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

## 2.4 WALL HUNG URINALS

- A. Manufacturers:
- 1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  - 3. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
- 1. Consumption Volume: 0.5 gal per flush, maximum.
  - 2. Flush Style: Washout.
  - 3. Flush Valve: Exposed (top spud).
  - 4. Flush Operation: Manual, oscillating handle.
  - 5. Trapway Outlet: Integral.
  - 6. Removable stainless steel strainer.
  - 7. Outlet Size and Location: 2 inches, rear side.
- C. Flush Valves:
- 1. Manufacturers:
    - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
    - c. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
-

- d. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 2. Sensor-Operated:
    - a. Type: ASME A112.19.5; chloramine-resistant, clog-resistant dual-seat diaphragm valve with vacuum breaker, stops and accessories.
    - b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with battery powered infrared sensor, and mechanical override or override push button.
    - c. Supplied Volume Capacity: 1.2 gal per flush.
  - 3. Exposed Type: Chrome-plated, escutcheon, integral screwdriver stop.
- D. Urinal Carriers:
- 1. Manufacturers:
    - a. Jay R. Smith Manufacturing Company: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
    - b. JOSAM Company: [www.josam.com/#sle](http://www.josam.com/#sle).
    - c. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

## 2.5 LAVATORIES

- A. Manufacturers:
- 1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  - 3. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 5. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
- B. Wall-Hung Basin:
- 1. Vitreous China: ASME A112.19.2; white, rectangular basin with splash lip, front overflow, and hanger. Size as indicated on drawings with 4-inch centerset spacing.
  - 2. Carrier:
    - a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
    - b. Manufacturers:
      - 1) Jay R. Smith MFG. Co: [www.jrsmith.com/#sle](http://www.jrsmith.com/#sle).
      - 2) JOSAM Company: [www.josam.com/#sle](http://www.josam.com/#sle).
      - 3) Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- C. Under-Mount Basin:
- 1. Vitreous China: ASME A112.19.2; white interior, oval shape, front overflow, seal of putty, caulking, or concealed vinyl gasket, and white exterior finish. Size as indicated on drawings.
- D. Supply Faucet:
- 1. Deck Mounted Faucet Manufacturers:
    - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
    - c. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
    - d. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 2. Two-Handle, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 0.5 gpm, low-flow. Chrome finish.
- E. Sensor Operated Faucet:
- 1. Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
  - 2. Spout Style: Standard.
  - 3. Power Supply:
    - a. Wired: 24 VAC with step-down dry transformer wired into line voltage.
  - 4. Mixing Valve: Internal, automatic.
  - 5. Water Supply: 3/8 inch compression connections.
  - 6. Aerator: Vandal resistant, 0.5 gpm, laminar flow device.



7. Automatic Shut-off: 30 seconds.
  8. Sensor Range: Factory set at 3 inch adjustable up to 24 inch.
  9. Finish: Polished chrome.
- F. Thermostatic Mixing Valve:
1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
  2. Braided hot and cold water supply lines.
  3. Chrome plated 17 gauge, 0.0538 inch brass P-trap with clean-out plug and arm with escutcheon.
- G. Lavatory Carrier:
1. Manufacturers:
    - a. JOSAM Company: [www.josam.com/#sle](http://www.josam.com/#sle).
    - b. Zurn Industries, LLC; \_\_\_\_\_: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

## 2.6 WALL-HUNG, SOLID SURFACE, MULTISTATION LAVATORY UNITS

- A. Manufacturers:
1. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  2. Bradley Company: [www.bradleycorp.com/#sle](http://www.bradleycorp.com/#sle).
- B. Description: Rectilinear, level-surface deck, seamless and integral elongated basin, with stainless steel enclosed pedestal cabinet.
- C. Deck and Bowl Material: Fabricate from molded engineered stone material consisting of natural quartz, granite, and other minerals in a matrix of thermoset acrylic modified bio-based polyester resin and meeting requirements of IAPMO Z124.
- D. Surface Burning Characteristics: Smoke developed index less than 450, and flame spread index less than 25, Class A, when tested in accordance with ASTM E84.
- E. Number of Wash Stations: Three.
- F. Color: As selected by Architect from manufacturer's full line.
- G. Faucet Drilling: 4 inch (100 mm) centerset drilling.
- H. Sensor-Operated Faucets:
1. High profile metering faucet with infrared and external temperature control.
  2. Vandal-resistant meeting requirements of ASME A112.18.1 and ADA Standards compliant.
  3. Body: Polished, chrome-plated commercial solid cast brass, with 4 inch (102 mm) centerset mounting with anti-rotation trim plate.
  4. Tempered Water Supply: ADA Standards compliant lever on faucet body.
  5. Aerator: Flow rate of 0.5 gpm at 20 to 80 psi operating range.
  6. Sensor Module: Water conserving, vandal-resistant adjustable sensor unit with timing turn-off delay and stationary object automatic timed cutoff, with battery diagnostic light, serviceable from above deck.
  7. Power Supply: 6 VDC lithium battery and single 115 VAC plug-in adapter.
  8. Thermostatic Mixing Valve:
    - a. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- I. Access Panel: Stainless steel.
- J. Support Frame: Wall-mounted, heavy gauge, stainless steel.

## 2.7 SINKS

- A. Manufacturers:
  - 1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 3. Elkay: [www.elkay.com/#sle](http://www.elkay.com/#sle).
- B. Undermount-Installed Single Compartment Bowl:
  - 1. ASME A112.19.3, stainless steel, 18 gauge, 0.050 inch, type 304 stainless steel.
  - 2. Undercoated bottom sound deadening pads.
  - 3. Drain: 3-1/2 inch, stainless steel with strainer, crumb cup, and tailpiece.
- C. Kitchen Faucets:
  - 1. Manufacturers:
    - a. American Standard, Inc; \_\_\_\_\_: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. Kohler: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 2. Single Handle Faucet with Three-Function Pulldown Spray Head:
    - a. Type: Deck-mount, swivel faucet with mounting plate.
    - b. Spray Functions: Stream, full spray and pause at 1.5 gpm, maximum.
    - c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
    - d. Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.

## 2.8 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. General:
  - 1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
  - 2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
    - a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
    - b. Comply with ICC A117.1.
  - 3. Color: High gloss white.
  - 4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

## 2.9 SHOWERS

- A. Manufacturers:
  - 1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 3. Symmons: [www.symmons.com/#sle](http://www.symmons.com/#sle).
- B. Hand-Held Shower Head:
  - 1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting with ASSE 1014 backflow preventer.
  - 2. Include 60 inch minimum flexible polished stainless steel hose and in-line vacuum breaker
  - 3. Provide 30 inch grab bar with sliding spray holder that locks at any height, allowing use of unit as either a hand-held spray or a fixed shower head.

## 2.10 BI-LEVEL, ELECTRIC WATER COOLERS

- A. Manufacturers:
  - 1. Elkay Manufacturing Company: [www.elkay.com/#sle](http://www.elkay.com/#sle).
  - 2. Haws Corporation: [www.hawsco.com/#sle](http://www.hawsco.com/#sle).
  - 3. Oasis International: [www.oasiscoolers.com/#sle](http://www.oasiscoolers.com/#sle).
- B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

1. Capacity: 8 gph of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

## 2.11 SERVICE SINKS

- A. Manufacturers:
1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Elkay Manufacturing Company: [www.elkay.com/#sle](http://www.elkay.com/#sle).
  3. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Bowl: 24 by 24 by 10 inches high, white molded high density composite, floor mounted, with 1-inch wide shoulders, stainless steel strainer.
- C. Trim: ASME A112.18.1 exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- D. Accessories:
1. Mop hanger.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### 3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### 3.3 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

### 3.4 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

### 3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### 3.6 CLEANING

- A. Clean plumbing fixtures and equipment.

### 3.7 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

### 3.8 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches to top of bowl rim.
    - b. Accessible: 18 inches to top of seat.
  - 2. Urinal:
    - a. Standard: 22 inches to top of bowl rim.
    - b. Accessible: 17 inches to top of bowl rim.
  - 3. Lavatory:
    - a. Standard: 31 inches to top of basin rim.
    - b. Accessible: 34 inches to top of basin rim.
  - 4. Drinking Fountain:
    - a. Standard Adult: 40 inches to top of basin rim.
    - b. Accessible: 36 inches to top of spout.
- B. Fixture Rough-In
  - 1. Water Closet (Flush Valve Type):
    - a. Cold Water: 1 Inch.
    - b. Waste: 4 Inch.
    - c. Vent: 2 Inch.
  - 2. Urinal (Flush Valve Type):
    - a. Cold Water: 3/4 Inch.
    - b. Waste: 2 Inch.
    - c. Vent: 1-1/2 Inch.
  - 3. Lavatory:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
    - d. Vent: 1-1/4 Inch.
  - 4. Sink:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
    - d. Vent: 1-1/4 Inch.
  - 5. Service Sink:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 3 Inch.
    - d. Vent: 1-1/2 Inch.
  - 6. Drinking Fountain:
    - a. Cold Water: 1/2 Inch.
    - b. Waste: 1-1/4 Inch.
    - c. Vent: 1-1/4 Inch.
  - 7. Shower:

- a. Hot Water: 1/2 Inch.
- b. Cold Water: 1/2 Inch.
- c. Waste: 1-1/2 Inch.
- d. Vent: 1-1/4 Inch.

**END OF SECTION**

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**SECTION 23 05 29**

**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Support and attachment components.

**1.2 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

**1.3 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- L. FM (AG) - FM Approval Guide; Current Edition.
- M. MFMA-4 - Metal Framing Standards Publication; 2004.
- N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- O. UL (DIR) - Online Certifications Directory; Current Edition.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

#### 1.5 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

#### 1.6 QUALITY ASSURANCE

- A. Comply with applicable building code.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
  - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
  - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Prefabricated Trapeze-Framed Metal Strut Systems:
  - 1. Manufacturers:
    - a. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - b. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).



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2. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
  3. Strut Channel or Bracket Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
  4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
  5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
  6. Accessories: Provide bracket covers, clamps, and vibration dampeners.
- C. Strut Channels:
1. Manufacturers:
    - a. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - b. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).
  2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
  3. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- D. Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring.
- E. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
  2. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Piping up to 1 inch: 1/4 inch diameter.
    - c. Piping larger than 1 inch: 3/8 inch diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- F. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  2. Liquid Temperatures Up To 122 degrees F:
    - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
    - b. Support From Below: MSS SP-58 Types 35 through 38.
- G. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
  2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
  3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
  4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
  5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
  6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
  7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
  8. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
- H. U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.
- I. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
- J. Insulation Clamps:
-

1. Two bolt-type clamps designed for installation under insulation.
  2. Material: Carbon steel with epoxy copper or zinc finish.
- K. Pipe Hangers:
1. Split Ring Hangers:
    - a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
    - b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
    - c. Provide hanger rod and nuts of the same type and material for a given pipe run.
    - d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
  2. Clevis Hangers, Adjustable:
    - a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
- L. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- M. Pipe Shields for Insulated Piping:
1. MSS SP-58 Type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel
  2. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
    - d. Minimum Service Temperature: Minus 40 degrees F.
    - e. Maximum Service Temperature: 178 degrees F.
    - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- N. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

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**SECTION 23 05 48**

**VIBRATION AND SEISMIC CONTROLS FOR HVAC**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Vibration isolators.
- C. Vibration-isolated and/or seismically engineered roof curbs.
- D. In-curb sound attenuation treatment.

**1.2 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete.

**1.3 REFERENCE STANDARDS**

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

**1.5 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
  - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
- B. In-Curb Sound Attenuation Treatment: Provide acoustic test data indicating characteristics of sound absorption and transmission loss through testing in accordance with ASTM E90.

**1.6 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.1 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
  - 1. Select vibration isolators to provide required static deflection.
  - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
- D. Equipment Isolation: As indicated on drawings.

### 2.2 VIBRATION ISOLATORS

- A. Manufacturers:
  - 1. Vibration Isolators:
    - a. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
    - b. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
    - c. Vibro-Acoustics: [www.vibro-acoustics.com/#sle](http://www.vibro-acoustics.com/#sle).
  - 2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.
- B. General Requirements:
  - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
  - 2. Spring Elements for Spring Isolators:
    - a. Color code or otherwise identify springs to indicate load capacity.
    - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
    - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
    - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
    - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
    - f. Selected to function without undue stress or overloading.
- C. Vibration Isolators for Nonseismic Applications:
  - 1. Resilient Material Isolator Mounts, Nonseismic:
    - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; fail-safe type.
  - 2. Spring Isolator Hangers, Nonseismic:
    - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
    - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

### 2.3 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

- A. Manufacturers:
  - 1. Vibration-Isolated and/or Seismically Engineered Roof Curbs:

- a. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - b. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
  - c. Vibro-Acoustics: [www.vibro-acoustics.com/#sle](http://www.vibro-acoustics.com/#sle).
  2. Source Limitations: Furnish vibration-isolated roof curbs and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.
- B. Vibration Isolation Curbs:
1. Nonseismic Curb Rail:
    - a. Location: Between existing roof curb and rooftop equipment.
    - b. Construction: Steel.
    - c. Integral vibration isolation to comply with requirements of this section.
    - d. Weather exposed components consist of corrosion resistant materials.
  2. Nonseismic Curb:
    - a. Location: Between structure and rooftop equipment.
    - b. Construction: Steel.
    - c. Integral vibration isolation to comply with requirements of this section.
    - d. Weather exposed components consist of corrosion resistant materials.

## 2.4 IN-CURB SOUND ATTENUATION TREATMENT

- A. Manufacturers:
1. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
- B. Description: Prefabricated composite acoustical panels for installation in equipment curb. Designed to attenuate sound transfer from mechanical equipment into spaces below curb.
- C. Sound Transmission Class: Not less than 30 when tested in accordance with ASTM E90.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
  1. Isolator Hangers:
    - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
    - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
  2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
  3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
  4. Adjust isolators to be free of isolation short circuits during normal operation.

5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspect vibration isolation and/or seismic control components for damage and defects.
- B. Vibration Isolation Systems:
  1. Verify isolator static deflections.
  2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

**END OF SECTION**



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## SECTION 23 05 93

### TESTING, ADJUSTING, AND BALANCING FOR HVAC

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

##### 1.2 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

##### 1.3 SUBMITTALS

- A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - d. Final test report forms to be used.
    - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 5. Units of Measure: Report data in I-P (inch-pound) units only.

#### PART 2 PRODUCTS - NOT USED

#### PART 3 EXECUTION

##### 3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
    - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
    - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
-

3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
  1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### 3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.
  8. Air coil fins are cleaned and combed.
  9. Access doors are closed and duct end caps are in place.
  10. Air outlets are installed and connected.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### 3.3 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### 3.4 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### 3.5 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. Check and adjust systems approximately six months after final acceptance and submit report.

### 3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- J. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- L. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

### 3.7 SCOPE

- A. Test, adjust, and balance the following:
  - 1. Air Cooled Refrigerant Condensers.
  - 2. Packaged Roof Top Heating/Cooling Units.
  - 3. Air Handling Units.
  - 4. Fans.
  - 5. Air Terminal Units.
  - 6. Air Inlets and Outlets.

### 3.8 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
    - 1. Model/Frame.
    - 2. HP/BHP.
    - 3. Phase, voltage, amperage; nameplate, actual, no load.
    - 4. RPM.
    - 5. Service factor.
  
  - B. Air Cooled Condensers:
    - 1. Identification/number.
    - 2. Location.
    - 3. Manufacturer.
    - 4. Model number.
    - 5. Serial number.
    - 6. Entering DB air temperature, design and actual.
    - 7. Leaving DB air temperature, design and actual.
    - 8. Number of compressors.
  
  - C. Cooling Coils:
    - 1. Identification/number.
    - 2. Location.
    - 3. Service.
    - 4. Manufacturer.
    - 5. Air flow, design and actual.
    - 6. Entering air DB temperature, design and actual.
    - 7. Entering air WB temperature, design and actual.
    - 8. Leaving air DB temperature, design and actual.
    - 9. Leaving air WB temperature, design and actual.
    - 10. Air pressure drop, design and actual.
  
  - D. Heating Coils:
    - 1. Identification/number.
    - 2. Location.
    - 3. Service.
    - 4. Manufacturer.
    - 5. Air flow, design and actual.
    - 6. Entering air temperature, design and actual.
    - 7. Leaving air temperature, design and actual.
    - 8. Air pressure drop, design and actual.
  
  - E. Air Moving Equipment:
    - 1. Location.
    - 2. Manufacturer.
    - 3. Model number.
    - 4. Serial number.
    - 5. Arrangement/Class/Discharge.
    - 6. Air flow, specified and actual.
    - 7. Return air flow, specified and actual.
    - 8. Outside air flow, specified and actual.
    - 9. Total static pressure (total external), specified and actual.
    - 10. Fan RPM.
  
  - F. Exhaust Fans:
    - 1. Location.
    - 2. Manufacturer.
    - 3. Model number.
-

4. Serial number.
  5. Air flow, specified and actual.
  6. Total static pressure (total external), specified and actual.
  7. Fan RPM.
- G. Duct Traverses:
1. System zone/branch.
  2. Duct size.
  3. Area.
  4. Design air flow.
  5. Test air flow.
  6. Duct static pressure.
- H. Air Monitoring Stations:
1. Identification/location.
  2. System.
  3. Design air flow.
  4. Test air flow.
- I. Terminal Unit Data:
1. Manufacturer.
  2. Type, constant, variable, single, dual duct.
  3. Identification/number.
  4. Location.
  5. Model number.
  6. Size.
  7. Minimum design air flow.
  8. Maximum design air flow.
  9. Maximum actual air flow.
  10. Inlet static pressure.
- J. Air Distribution Tests:
1. Air terminal number.
  2. Room number/location.
  3. Terminal type.
  4. Terminal size.
  5. Design air flow.
  6. Test (final) air flow.
  7. Percent of design air flow.

**END OF SECTION**

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**SECTION 23 07 13**

**DUCT INSULATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Duct insulation.

**1.2 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**1.3 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.5 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

**PART 2 PRODUCTS**

**2.1 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

**2.2 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
  - 1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 3. Knauf Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).



- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1,200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, white color.
- F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Insulated Ducts Conveying Air Below Ambient Temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

### **END OF SECTION**

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**SECTION 23 07 19**

**HVAC PIPING INSULATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Piping insulation.
- B. Weather barrier coatings.
- C. Jacketing and accessories.
- D. Engineered wall outlet seals and refrigerant piping insulation protection.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.

**1.3 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- G. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.1 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

**2.2 GLASS FIBER, FLEXIBLE**

- A. Manufacturers:
  - 1. JP Lamborn Co: [www.jpflex.com/#sle](http://www.jpflex.com/#sle).
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1,200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.

- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film with pressure-sensitive rubber-based adhesive.
- E. Outdoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

## **2.3 GLASS FIBER, RIGID**

### **2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Manufacturers:
  - 1. Aeroflex USA: [www.aeroflexusa.com/#sle](http://www.aeroflexusa.com/#sle).
  - 2. Armacell LLC: [www.armacell.us/#sle](http://www.armacell.us/#sle).
  - 3. K-Flex USA LLC: [www.kflexusa.com/#sle](http://www.kflexusa.com/#sle).
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - 1. Minimum Service Temperature: Minus 40 degrees F.
  - 2. Maximum Service Temperature: 180 degrees F.
  - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- D. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

### **2.5 JACKETING AND ACCESSORIES**

- A. PVC Plastic.
  - 1. Manufacturers:
    - a. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil, 0.010 inch.
    - e. Connections: Brush on welding adhesive.

### **2.6 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION**

- A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
  - 1. Outlet Cover Color: Gray.
- B. Insulation Protection System: Refrigerant piping insulation PVC protective cover.
  - 1. PVC Insulation Cover Color: White with full-length velcro fastener.
  - 2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
  - 3. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.

### **2.7 ACCESSORIES**

- A. General Requirements:
-

1. Provide required accessories in accordance with and subject to the recommendations of the insulation manufacturer.
2. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
3. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
4. Supply materials that are asbestos free.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
  1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
  1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.
- G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with PVC jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

### **END OF SECTION**

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**SECTION 23 23 00**  
**REFRIGERANT PIPING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Filter-driers.
- H. Solenoid valves.
- I. Exterior penetration accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 07 16 - HVAC Equipment Insulation.
- B. Section 23 07 19 - HVAC Piping Insulation.

**1.3 REFERENCE STANDARDS**

- A. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.
- B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- E. ASME B31.9 - Building Services Piping; 2020.
- F. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- G. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- I. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.
- B. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store piping and specialties in shipping containers with labeling in place.

- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

## **PART 2 PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- A. Liquid Indicators:
  - 1. Use line size liquid indicators in main liquid line leaving condenser.
  - 2. If receiver is provided, install in liquid line leaving receiver.
  - 3. Use line size on leaving side of liquid solenoid valves.
- B. Valves:
  - 1. Use service valves on suction and discharge of compressors.
  - 2. Use gauge taps at compressor inlet and outlet.
  - 3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
  - 4. Use check valves on compressor discharge.
  - 5. Use check valves on condenser liquid lines on multiple condenser systems.
- C. Strainers:
  - 1. Use line size strainer upstream of each automatic valve.
  - 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
- D. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- E. Filter-Driers:
  - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
- F. Solenoid Valves:
  - 1. Use in liquid line of single or multiple evaporator systems.

### **2.2 REGULATORY REQUIREMENTS**

- A. Comply with ASME B31.9 for installation of piping system.

### **2.3 PIPING**

- A. Copper Tube: ASTM B280, H58 hard drawn.
  - 1. Fittings: ASME B16.22 wrought copper.
  - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- B. Pipe Supports and Anchors:
  - 1. Provide hangers and supports that comply with MSS SP-58.
    - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
  - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 6. Vertical Support: Steel riser clamp.
  - 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
  - 8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
  - 9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit



threaded hanger rods.

## **2.4 REFRIGERANT**

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

## **2.5 MOISTURE AND LIQUID INDICATORS**

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

## **2.6 VALVES**

- A. Ball Valves:
  - 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.
- B. Service Valves:
  - 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

## **2.7 STRAINERS**

- A. Straight Line or Angle Line Type:
  - 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

## **2.8 CHECK VALVES**

- A. Straight Through Type:
  - 1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

## **2.9 FILTER-DRIERS**

- A. Performance:
  - 1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
  - 2. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
  - 1. Connections: As specified for applicable pipe type.

## **2.10 SOLENOID VALVES**

- A. Valve: AHRI 760 (I-P), pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, soldered, or threaded ends; for maximum working pressure of 500 psi.
- B. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

## **2.11 EXTERIOR PENETRATION ACCESSORIES**

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be

installed.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

#### **3.2 INSTALLATION**

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
  - 1. Support horizontal piping as indicated.
  - 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 3. Place hangers within 12 inches of each horizontal elbow.
  - 4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 5. Provide copper plated hangers and supports for copper piping.
- G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Provide access to concealed valves and fittings.
- J. Flood piping system with nitrogen when brazing.
- K. Insulate piping.
- L. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- M. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- N. Fully charge completed system with refrigerant after testing.

#### **3.3 FIELD QUALITY CONTROL**

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test and repair piping until no leakage.

**END OF SECTION**

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**SECTION 23 31 00**  
**HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Metal ducts.
- B. Flexible ducts.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
- B. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- C. Section 23 33 00 - Air Duct Accessories.
- D. Section 23 36 00 - Air Terminal Units.
- E. Section 23 37 00 - Air Outlets and Inlets: Fabric air distribution devices.

**1.3 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- G. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide data for duct materials.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

**1.6 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated.
- C. Duct Shape and Material in accordance with Allowed Static Pressure Range:
  - 1. Round: Plus or minus 4 in-wc of galvanized steel.
  - 2. Rectangular: Plus or minus 3 in-wc of galvanized steel.
- D. Duct Sealing and Leakage in accordance with Static Pressure Class:
  - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 3 in-wc pressure class, galvanized steel.
    - b. Outside Air Intake: 1 in-wc pressure class, galvanized steel.
    - c. Return and Relief Air: 1 in-wc pressure class, galvanized steel.
    - d. General Exhaust Air: 1 in-wc pressure class, galvanized steel.
  - 2. Low Pressure Service: Up to 2 in-wc:
    - a. Seal: Class C, apply to seal off transverse joints.
    - b. Leakage:
      - 1) Rectangular: Class 24 or 24 cfm/100 sq ft.
      - 2) Round: Class 12 or 12 cfm/100 sq ft.
  - 3. Low Pressure Service: From 2 in-wc to 3 in-wc:
    - a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.
    - b. Leakage:
      - 1) Rectangular: Class 12 or 12 cfm/100 sq ft.
      - 2) Round: Class 6 or 6 cfm/100 sq ft.
- E. Duct Fabrication Requirements:
  - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
  - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
  - 3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
  - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
  - 5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
  - 6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
  - 7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

### 2.2 METAL DUCTS

- A. Material Requirements:
  - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Round Metal Ducts:
  - 1. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.

- a. Insulation:
  - 1) Thickness: 1 inch.
  - 2) Material: Fiberglass.
2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
- C. Round Spiral Duct:
  1. Round spiral lock seam duct with galvanized steel outer wall.
- D. Connectors, Fittings, Sealants, and Miscellaneous:
  1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
  2. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
    - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
    - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
    - c. For Use with Flexible Ducts: UL labeled.
  3. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

### 2.3 FLEXIBLE DUCTS

- A. Vapor Barrier Insulated Flexible Air Ducts:
  1. UL 181, Class 1, two-ply polyester film supported by helically wound spring steel wire.
  2. Insulation: Fiberglass insulation with polyethylene vapor barrier core.
  3. Pressure Rating: From 6 in-wc positive to 1/2 in-wc negative.
  4. Maximum Velocity: 4,000 fpm.
  5. Temperature Range: Minus 10 to 160 degrees F.
  6. Manufacturers:
    - a. JP Lamborn Co: [www.jpflex.com/#sle](http://www.jpflex.com/#sle).
    - b. FlexMaster USA: [www.flexmasterusa.com/#sle](http://www.flexmasterusa.com/#sle).

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Flexible Ducts: Connect to metal ducts with draw bands.
- G. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- H. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.
- I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- J. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.
- K. Use double nuts and lock washers on threaded rod supports.
- L. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- M. Connect diffusers or light troffer boots to low-pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.
- N. At exterior wall louvers, seal duct to louver frame.
- O. Louver Fit-out:
  - 1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
  - 2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.
- P. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 23 33 00, 23 36 00, and 23 37 00.
- Q. Duct Insulation: Provide duct insulation. See Section 23 07 13.

### **3.2 CLEANING**

- A. Clean duct system by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

**END OF SECTION**

**SECTION 23 33 00**  
**AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Backdraft dampers - metal.
- B. Duct access doors.
- C. Fire dampers.
- D. Flexible duct connectors.
- E. Volume control dampers.
- F. Miscellaneous Products:
  - 1. Damper operators.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 31 00 - HVAC Ducts and Casings.
- B. Section 25 35 13 - Integrated Automation Actuators and Operators: Damper operators.

**1.3 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, and hardware used. Include electrical characteristics and connection requirements.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Fusible Links: One of each type and size.

**1.5 QUALITY ASSURANCE**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 PRODUCTS**

**2.1 BACKDRAFT DAMPERS - METAL**

- A. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.



## 2.2 DUCT ACCESS DOORS

- A. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.
  - 1. Less Than 12 inches Square: Secure with sash locks.
  - 2. Up to 18 inches Square: Provide two hinges and two sash locks.
- B. Access doors with sheet metal screw fasteners are not acceptable.

## 2.3 FIRE DAMPERS

- A. Manufacturers:
  - 1. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  - 2. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 3. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
  - 4. Greenheck: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for closure under air flow conditions. Configure with blades out of air stream.
- D. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

## 2.4 FLEXIBLE DUCT CONNECTORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
    - a. Net Fabric Width: Approximately 2 inches wide.
  - 2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.
- C. Maximum Installed Length: 14 inch.

## 2.5 VOLUME CONTROL DAMPERS

- A. Manufacturers:
  - 1. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  - 2. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 3. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers:
  - 1. Fabricate for duct sizes up to 6 by 30 inch.
  - 2. Blade: 24 gauge, 0.0239 inch, minimum.
- D. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
  - 1. Blade: 18 gauge, 0.0478 inch, minimum.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

## 2.6 MISCELLANEOUS PRODUCTS

- A. Damper Operators: Provide manual operators.
-

- B. Residential Dryer Exhaust Receptacle: Formed aluminized-steel in-wall receptacle to house flexible transition duct; seamless interior, rounded corners; integral nailing flanges. Match depth of box to depth of stud cavity.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch size access door for balancing dampers only. Review locations prior to fabrication.
- D. Provide fire dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- E. Demonstrate re-setting of fire dampers to Owner's representative.
- F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.
- I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

#### **END OF SECTION**

## SECTION 23 34 23

### HVAC POWER VENTILATORS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Roof exhausters.

##### 1.2 RELATED REQUIREMENTS

- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
- B. Section 23 31 00 - HVAC Ducts and Casings.
- C. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

##### 1.3 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).
- E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- H. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate fan roof curbs and service utilities installation according to fan size.

##### 1.5 SUBMITTALS

- A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

##### 1.6 FIELD CONDITIONS

- A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

#### PART 2 PRODUCTS

##### 2.1 MANUFACTURERS

- A. Greenheck Fan Corporation: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- B. Loren Cook Company: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).

- C. PennBarry, Division of Air System Components: [www.pennbarry.com/#sle](http://www.pennbarry.com/#sle).

## **2.2 POWER VENTILATORS - GENERAL**

- A. Static and Dynamically Balanced: Comply with AMCA 204.
- B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D. Fabrication: Comply with AMCA 99.
- E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- G. Enclosed Safety Switches: Comply with NEMA 250.

## **2.3 ROOF EXHAUSTERS**

- A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.
- C. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor and solid-state speed controller.
- D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Install backdraft dampers on inlet to roof and wall exhausters.

**END OF SECTION**

**SECTION 23 37 00**

**AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Diffusers:
- B. Rectangular ceiling diffusers.
- C. Registers/grilles:
  - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.
  - 2. Ceiling-mounted, exhaust and return register/grilles.
  - 3. Wall-mounted, supply register/grilles.
  - 4. Wall-mounted, exhaust and return register/grilles.
- D. Duct-mounted supply and return registers/louvers.
- E. Louvers:

**1.2 RELATED REQUIREMENTS**

- A. Section 09 91 23 - Interior Painting: Painting of ducts visible behind outlets and inlets.

**1.3 REFERENCE STANDARDS**

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.
- B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

**1.4 SUBMITTALS**

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

**1.5 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS**

- A. Krueger-HVAC: [www.krueger-hvac.com/#sle](http://www.krueger-hvac.com/#sle).
  - B. Metalaire, a brand of Metal Industries Inc: [www.metalaire.com/#sle](http://www.metalaire.com/#sle).
  - C. Price Industries: [www.priceindustries.com/#sle](http://www.priceindustries.com/#sle).
  - D. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - E. Titus, a brand of Air Distribution Technologies: [www.titus-hvac.com/#sle](http://www.titus-hvac.com/#sle).
  - F. Greenheck: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
-

## **2.2 RECTANGULAR CEILING DIFFUSERS**

- A. Type: Provide square formed backpan stamped and core removable ceiling diffusers constructed to maintain 360 degree discharge air pattern.
- B. Connections: Round.
- C. Frame: Provide surface mount and inverted T-bar type, as required.
- D. Fabrication: Aluminum with baked enamel finish.
- E. Color: As selected by Architect from manufacturer's standard range.

## **2.3 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS**

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.
- B. Color: As selected by Architect from manufacturer's standard range.

## **2.4 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

## **2.5 CEILING EGG CRATE EXHAUST AND RETURN GRILLES**

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Frame: Channel lay-in frame for suspended grid ceilings.

## **2.6 WALL SUPPLY REGISTERS/GRILLES**

- A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

## **2.7 WALL EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

## **2.8 LOUVERS**

- A. Manufacturers:
  - 1. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
  - 2. Greenheck: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- B. Type: 6 inch deep frame with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over intake or exhaust end.
- C. Fabrication: 12 gauge, 0.1046 inch (2.66 mm) thick extruded aluminum welded assembly, with factory prime coat finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Mounting: Furnish with masonry strap anchors for installation.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 91 23.

### **3.2 CLOSEOUT ACTIVITIES**

- A. Demonstrate operational system to Owner's representative.
- B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

### **3.3 PROTECTION**

- A. Protect installed products until completion of project.
- B. Replace, repair, or touch-up damaged products before Substantial Completion.

## **END OF SECTION**

**SECTION 23 74 16**

**PACKAGED ROOFTOP AIR-CONDITIONING UNITS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Packaged, large-capacity, rooftop air-conditioning units.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
- B. Section 23 40 00 - HVAC Air Cleaning Devices.
- C. Section 26 05 83 - Wiring Connections: Installation and wiring of thermostats and other control components; wiring from unit terminal strip to remote panel.
- D. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

**1.3 REFERENCE STANDARDS**

- A. AMCA 611 - Certified Ratings Program - Product Rating Manual for Airflow Measurement Stations; 2015.
- B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

**1.4 SUBMITTALS**

- A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- B. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Filters: One set for each unit.

**1.5 QUALITY ASSURANCE**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place and ready for immediate installation of units.



## 1.7 WARRANTY

- A. Provide a five year warranty to include coverage for refrigeration compressors.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Carrier Corporation: [www.commercial.carrier.com/#sle](http://www.commercial.carrier.com/#sle).
- B. Johnson Controls International, PLC: [www.johnsoncontrols.com/#sle](http://www.johnsoncontrols.com/#sle).
- C. Trane Technologies, PLC: [www.trane.com/#sle](http://www.trane.com/#sle).
- D. Daikin Applied: [www.daikinapplied.com/#sle](http://www.daikinapplied.com/#sle).

### 2.2 PACKAGED, LARGE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

- A. General: Roof mounted units having gas burner and electric refrigeration that are 25 tons and larger in capacity.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, relief fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
- D. Electrical Characteristics:
  - 1. 480 volts, three phase, 60 Hz.
- E. Disconnect Switch: Factory mount disconnect switch in control panel.

### 2.3 CASING

- A. Cabinet: Galvanized steel with baked enamel finish, including access doors with piano hinges and locking handle. Structural members to be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.
- B. Insulation: 1/2-inch thick, neoprene-coated glass fiber with edges protected from erosion.

### 2.4 FANS

- A. Supply and Exhaust Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, and rubber isolated hinge mounted. Provide with high efficiency motor or direct drive as indicated. Isolate complete fan assembly. See Section 23 05 48.

### 2.5 BURNERS

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame-sensing device, and automatic 100 percent shutoff pilot.
  - 1. Construction: Welded stainless steel.
- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after airflow proven and slight delay, allow gas valve to open.
- C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature, and energize burner when temperature drops to lower safe value.

## 2.6 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

## 2.7 CONDENSER COIL

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.
- C. Provide refrigerant pressure switches to cycle condenser fans.

## 2.8 HEAT RECOVERY COIL

- A. Provide copper tube aluminum fin coil assembly with multiple circuits arranged to provide heat recovery.

## 2.9 COMPRESSORS

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.
- B. Five minute timed off circuit to delay compressor start.
- C. Provide step capacity control by cycling compressors.

## 2.10 MIXED AIR CASING

- A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position.
- B. Gaskets: Provide tight fitting dampers with edge gaskets.
- C. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.
- D. Mixed Air Controls: Maintain selected supply air temperature and return dampers to minimum position on call for heating and above 75 degrees F ambient, or when ambient air temperature exceeds return air temperature.

## 2.11 AIR FILTERS:

- A. 2-inch thick, glass fiber disposable media in metal frames.

## 2.12 AIRFLOW MEASUREMENT

- A. Airflow Measurement Station:
  - 1. Provide factory-installed airflow measurement station tested in accordance with AMCA 611 and bearing AMCA Ratings Seal for Airflow Measurement Performance.
  - 2. Station Location: Install in outdoor openings to measure airflow.
  - 3. Damper Blades:
    - a. Galvanized steel or extruded aluminum construction.
    - b. Housed in galvanized steel or extruded aluminum frame and mechanically fastened to a rotating axle rod.
    - c. Comply with ASHRAE Std 90.1 I-P for rated maximum leakage rate.
  - 4. Measurement Range: Minimum of 15 percent to 100 percent of unit nominal flow.

5. Operation: Provide low voltage signal corresponding to actual airflow for controlling and documenting airflow.
6. Accuracy: Plus or minus 5 percent.

### **2.13 OPERATING CONTROLS - SINGLE ZONE UNITS**

- A. Electric solid state microcomputer-based room thermostat,.
- B. Room thermostat to incorporate:
  1. Automatic switching from heating to cooling.
  2. Preferential rate control to minimize overshoot and deviation from setpoint.
  3. Set up for four separate temperatures per day.
  4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
  5. Short cycle protection.
  6. Programming based on weekdays, Saturday and Sunday.
- C. Room thermostat display to include:
  1. Actual room temperature.
  2. Programmed temperature.
  3. System model indication: heating, cooling, auto, off, fan auto, fan on.

### **2.14 ROOF CURBS**

- A. Vibration Isolation Curb: Refer to Section 23 05 48.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that roof is ready to receive work and opening dimensions are as required by manufacturer.
- B. Verify that proper power supply is available.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

### **3.3 SYSTEM STARTUP**

- A. Prepare and start equipment. Adjust for proper operation.

### **3.4 CLOSEOUT ACTIVITIES**

- A. Demonstrate proper operation of equipment to Owner's designated representative.

**END OF SECTION**

## SECTION 23 74 33

### DEDICATED OUTDOOR AIR UNITS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Roof-mounted DOAS.
- B. Controls.

##### 1.2 RELATED REQUIREMENTS

- A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- B. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
- C. Section 23 09 34 - Variable-Frequency Motor Controllers for HVAC.
- D. Section 23 11 23 - Facility Natural-Gas Piping: Natural gas connections.
- E. Section 23 33 00 - Air Duct Accessories: Flexible duct connections.
- F. Section 25 14 00 - Integrated Automation Local Control Units.
- G. Section 25 15 00 - Integrated Automation Software: BAS, BMS, or SCADA.

##### 1.3 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 54 - National Fuel Gas Code; 2024.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- I. UL (DIR) - Online Certifications Directory; Current Edition.
- J. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

##### 1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

- C. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

## 1.6 WARRANTY

- A. Provide five year manufacturers warranty for compressor/condenser unit.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Greenheck: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- B. Daikin: [www.daikinapplied.com/#sle](http://www.daikinapplied.com/#sle).
- C. AAON: [www.aaon.com/#sle](http://www.aaon.com/#sle).

### 2.2 ROOF-MOUNTED DOAS

- A. Packaged Unit:
  - 1. Casing and Components:
    - a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
    - b. 18 gauge, 0.0478 inch steel panels reinforced with structural angles and channels to ensure rigidity.
    - c. Provide bolted access panels to access each sections from either side of unit.
    - d. Provide hinged door with lockable handle for serviceable sections.
    - e. Drain Pan: Galvanized steel with corrosion-resistant coating.
  - 2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
  - 3. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.
  - 4. Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.
  - 5. External Surface Finish: Heat resistant baked enamel.
  - 6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
  - 7. Outside Air Damper with Rain Hood and Screen:
    - a. Set outdoor air dampers to fully open when fan starts and close 30 seconds after fan stops, adjustable.
- B. Filter Section:
  - 1. Filter: Removable, 2 inches thick MERV-8.
  - 2. Monitoring: Provide gauge with loaded setpoint-adjustable signal flag or external tag. Provide loaded filter alarm switch wired into unit controls with illuminated indicator on local control panel face.
- C. Heating Section:
  - 1. Indirect Gas-Fired Furnace:
    - a. Fully sealed natural gas burning assembly configured for modulated 12:1 turn down ratio using electrically operated devices including modulating main gas valve, shut down valve, main gas, and pilot gas regulators. Manual main gas shut-off valve and pilot adjustment valve.
    - b. Insulation: Neoprene faced glass fiber insulation, 1 inch thick, on inlet components to burner profile plate.
    - c. Observation Port: On burner section for observing main and pilot flames.

- d. Pilot: Electrically ignited by spark rod through high voltage ignition transformer.
  - e. Damper: Motorized with end switch to prove position before burner will fire.
- D. Cooling Section:
- 1. Packaged DX Cooling:
    - a. Configuration: AHRI 520 rated, R-410a refrigerant system with hot gas bypass.
    - b. Evaporator Coil: Copper tube aluminum fin coil assembly with alternate row circuiting, and with galvanized drain pan and thermostatic expansion valve.
    - c. Compressor: Inverter-duty hermetic reciprocating, 3,600 rpm maximum resilience with positive lubrication, crankcase heater, high pressure control, low pressure control, motor overload protection, service valves and dryer.
    - d. Condenser Side: Aluminum microchannel coil, direct drive axial fan resiliently mounted, galvanized fan guard. ECM condenser fans.
    - e. Operating and Safety Controls: Internally coordinated with main unit controls.
- E. Fan Section:
- 1. Provide direct or plenum mounted variable-speed fan motors; see Section 23 05 13.
  - 2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
  - 3. Factory program for both soft start and constant flow output over static pressure range.
  - 4. Provide preinstalled neutral wire protection when required to support specified fan type.
  - 5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
  - 6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
  - 7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 23 09 34.
  - 8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.
- F. Unit Controls:
- 1. DDC:
    - a. Application Specific Controller; see Section 25 14 00 unless factory-provided.
    - b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
    - c. Coordination and Sequencing:
      - 1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
      - 2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
      - 3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freezestat.
  - 2. Local Control Panel: Interface to include on-off-auto switch, summer-winter switch, heat-off-cool switch, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.
  - 3. Interlocked Functions:
    - a. Unit to operate when during occupied hours.
    - b. Low and High Limit Controls: Maintain supply air temperature between set points and shut fan down if temperatures are exceeded. Include manual reset switch.
- G. Electrical: 480 VAC, 3-phase, 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.
-

- H. Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.
- C. Follow NFPA 54 guidelines to provide natural gas system connection; see Section 23 11 23.
- D. Install unit on vibration isolator pad or roof curb; see Section 23 05 48.
- E. Provide flexible duct connections on inlet and outlet from unit; see Section 23 33 00.
- F. Connect drain pan outlet to nearest building drain system piping.
- G. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote BAS.

**END OF SECTION**

**SECTION 23 81 26.13**

**SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Air cooled condensing units.
- B. Indoor air handling (fan and coil) units for ductless systems.
- C. Controls.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

**1.3 REFERENCE STANDARDS**

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

**1.4 SUBMITTALS**

- A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- C. Design Data: Indicate refrigerant pipe sizing.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Filters: One for each unit.

**1.5 WARRANTY**

- A. Provide five year manufacturers warranty for heat exchangers and compressors.



## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Carrier Corporation: [www.carrier.com/#sle](http://www.carrier.com/#sle).
- B. Trane Technologies, PLC: [www.trane.com/#sle](http://www.trane.com/#sle).
- C. York International Corporation / Johnson Controls: [www.york.com/#sle](http://www.york.com/#sle).
- D. Daikin Applied: [www.daikinapplied.com/#sle](http://www.daikinapplied.com/#sle).

### **2.2 SYSTEM DESIGN**

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
  - 1. Heating: None.
  - 2. Cooling: Outdoor electric condensing unit with evaporator coils in multiple ductless indoor units ("mini-split").
  - 3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
- C. Electrical Characteristics:
  - 1. 208 volts, single phase, 60 Hz.
  - 2. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 05 83.

### **2.3 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS**

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
  - 1. Location: High-wall.
  - 2. Cabinet: Galvanized steel.
    - a. Finish: White.
  - 3. Fan: Line-flow fan direct driven by a single motor.
  - 4. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
  - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
  - 2. Manufacturer: System manufacturer.

### **2.4 OUTDOOR UNITS**

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
  - 1. Comply with AHRI 210/240.
  - 2. Refrigerant: R-410A.
  - 3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
  - 4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
- B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

- C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
  - 1. Condenser Fans: Direct-drive propeller type.
  - 2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.
- D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
- E. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
  - 1. Provide thermostatic expansion valves.
- F. Operating Controls:
  - 1. Control by room thermostat to maintain room temperature setting.
  - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.
- G. Mounting Pad: Precast concrete parking bumpers, minimum 4 inches square; minimum of two located under cabinet feet.

## 2.5 ACCESSORY EQUIPMENT

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
  - 1. Automatic switching from heating to cooling.
  - 2. Preferential rate control to minimize overshoot and deviation from setpoint.
  - 3. Instant override of setpoint for continuous or timed period from one hour to 31 days.
  - 4. Short cycle protection.
  - 5. Programming based on weekdays, Saturday and Sunday.
  - 6. Thermostat Display:
    - a. Actual room temperature.
    - b. Programmed temperature.
    - c. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.

## END OF SECTION

## SECTION 23 81 29

### VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Air-source outdoor units.
- B. Refrigerant piping.
- C. Refrigerant branch units.
- D. Indoor units.

##### 1.2 RELATED REQUIREMENTS

- A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- B. Section 23 07 19 - HVAC Piping Insulation.
- C. Section 23 23 00 - Refrigerant Piping.
- D. Section 23 74 33 - Dedicated Outdoor Air Units.

##### 1.3 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment; 2021.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Addendum (2024).
- E. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Addendum (2024).
- F. ITS (DIR) - Directory of Listed Products; Current Edition.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

##### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:
  - 1. Outdoor Units:
    - a. Refrigerant Type and Size of Charge.
    - b. Output and Input Cooling Capacity: Btu/h.
    - c. Output and Input Heating Capacity: Btu/h.
    - d. Operating Temperature Range, Cooling and Heating.
    - e. Fan Capacity: Flow in cfm with respective fan curves.

- f. External Static Pressure (ESP): In-wc.
  - g. Sound Pressure Level: dB(A).
  - h. Electrical Data: Complete including motor size.
  - i. Maximum number of indoor units that can be served.
  - j. Maximum refrigerant piping run from outdoor unit to indoor unit(s).
  - k. Maximum height difference between outdoor unit to Indoor unit(s), both above and below.
2. Indoor Units:
    - a. Output and Input Cooling Capacity: Btu/h.
    - b. Output and Input Heating Capacity: Btu/h.
    - c. Fan Capacity: Flow in cfm with respective fan curves.
    - d. External Static Pressure (ESP): In-wc.
    - e. Electrical Data: Complete including motor size.
    - f. Maximum Lift of Built-in Condensate Pump.
  3. Control Panels: Complete data of controllers, input-output points, and zones.
- B. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
1. Detailed piping diagrams, with branch balancing devices.
  2. Condensate piping routing, size, and pump connections.
  3. Detailed power wiring diagrams.
  4. Detailed control wiring diagrams.
  5. Locations of required access through fixed construction.
  6. Drawings required by manufacturer.
- C. Operating and Maintenance Data:
1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
  2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
  3. Identification of replaceable parts and local source of supply.
- D. Warranty: Executed warranty, made out in Owner's name.
- E. Project Record Documents: Record the following:
1. As-installed routing of refrigerant piping and condensate piping.
  2. Locations of access panels.
  3. Locations of control panels.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.
  2. Company that provides system design software to installers.
- B. Installer Qualifications: Trained and approved by manufacturer of equipment.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

## 1.7 WARRANTY

- A. Compressors: Provide manufacturer's warranty for 5 years from date of installation.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Daikin: [www.daikinac.com/#sle](http://www.daikinac.com/#sle).
- B. LG Electronics U.S.A., Inc: [www.lghvac.com/#sle](http://www.lghvac.com/#sle).
- C. Mitsubishi Electric Trane HVAC US, LLC: [www.metahvac.com/#sle](http://www.metahvac.com/#sle).

### **2.2 VARIABLE REFRIGERANT FLOW SYSTEM**

- A. Minimum System Requirements:
  - 1. System Testing, Capacity Rating, and Performance:
    - a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h.
    - b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h.
  - 2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
  - 3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.
  - 4. Cooling Mode Interior Performance:
    - a. Daytime Setpoint: 72 degrees F, plus or minus 2 degrees F.
    - b. Setpoint Range: 57 degrees F to 77 degrees F.
    - c. Night Setback: 78 degrees F.
    - d. Interior Relative Humidity: 50 percent, maximum.
  - 5. Heating Mode Interior Performance:
    - a. Setpoint: 68 degrees F, plus or minus 2 degrees F.
    - b. Setpoint Range: 59 to 80 degrees F.
    - c. Night Setback: 60 degrees F.
- B. System Design and Installation Considerations:
  - 1. Conditioned spaces and zones are indicated on drawings.
  - 2. Outside unit locations are indicated on drawings.
  - 3. Indoor unit locations are indicated on drawings.
  - 4. Required equipment unit capacities are indicated on drawings.
  - 5. Refrigerant piping sizes are not indicated on drawings.
  - 6. Condensate piping to nearest drain is indicated on drawings.
  - 7. Provide calculations showing ASHRAE Std 15 guideline compliance.

### **2.3 AIR-SOURCE OUTDOOR UNITS**

- A. Heat Recovery Type:
  - 1. DX refrigeration unit piped to one or more compatible indoor units either directly or indirectly through one or more intermediate refrigeration branch units.
  - 2. Manifold two or to three units as recommended by manufacturer to handle sequencing and coordination of multiple indoor units.
- B. Unit Cabinet:
  - 1. Capable of being installed with wiring and piping to the left, right, rear or bottom.
  - 2. Designed to allow side-by-side installation with minimum spacing and vibration isolation.
  - 3. Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
  - 4. Sound Pressure Level: 55 dB measured at 3 feet from front of unit.
- C. Heat Sink Side:
  - 1. Condenser Fans:
    - a. Provide minimum of 2 fans for each condenser within the outdoor unit.
    - b. Minimum External Static Pressure: Factory set at 0.12 in-wc.

- c. Fan Type: Vertical discharging, direct-driven propeller type with variable speed operation using DC-controlled ECM motors mechanically connected using permanently lubricated bearings having whole assembly protected with fan guards.
  - 2. Condenser Coils:
    - a. Hi-X seamless copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
- D. Refrigeration Side:
  - 1. Factory assembled and wired with instrumentation, switches, and controller(s) to handle unit specifics with direct coordination of remote controller(s) from indoor unit(s).
  - 2. Refrigeration Circuit: ECM driven dual scroll compressors, fans, condenser heat sink coil, expansion valves, solenoid valves, distribution headers, capillaries, filters, shutoff valves, oil separators, service ports, and refrigerant regulator.
  - 3. Refrigerant: R-410a factory charged. Controller to alarm when charge is below capacity.
  - 4. Variable Volume Control: Modulate compressed refrigerant capacity automatically to maintain constant suction and condensing pressures under varying refrigerant volume required to handle remote loads. Include defrost control.
  - 5. Provide refrigerant subcooling to ensure the liquid refrigerant does not flash when supplying to use indoor units.
  - 6. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle, oil return, or defrost is not permitted due to potential reduction in space temperature.
  - 7. Power Failure Mode: Automatically restarts operation after power failure without loss of programmed settings.
  - 8. Safety Devices: High pressure sensor with cut-out switch, low pressure sensor with cut-out switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, overcurrent protection for the inverter and antirecycling timers.
  - 9. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.
- E. Local Controls:
  - 1. Include factory-wired instruments, sensors, switches, and safeties for unit control.
  - 2. Configured to coordinate internal unit operation with remote indoor units and with built-in capacity to coordinate other manifolded outdoor units and remote refrigerant branch unit(s).
  - 3. Include screen and button interface to setup operating schedules, setpoints, alarms, and remote unit setpoint coordination. Also used for system troubleshooting.
  - 4. Self diagnostic, auto-check functions to detect malfunctions and display the type and location.
- F. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet IP.
- G. Power:
  - 1. Electrical Requirement: 208 to 230 VAC, 3-phase, 60 Hz.
  - 2. Outdoor Mounted: Provide fused NEMA 250 Type 4X disconnect switch.

## 2.4 REFRIGERANT PIPING

- A. Two-Pipe Run: Provide low-pressure vapor and high-pressure vapor gas pipes for each indoor unit selected for seasonal heating or cooling service.
- B. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.
- C. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

## 2.5 REFRIGERANT BRANCH UNITS

- A. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.
- B. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.
- C. Minimum Requirements:
  - 1. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.
  - 2. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
  - 3. Energize subcooling heat exchanger during simultaneous heating and cooling service.
  - 4. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
  - 5. Refrigerant Connections: Braze type.
  - 6. Condensate Drainage: Provide unit that does not require condensate drainage.

## 2.6 INDOOR UNITS

- A. Manufacturers:
  - B. Minimum Unit Requirements:
    - 1. DX Evaporator Coil:
      - a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
      - b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.
      - c. Provide thermistor on liquid and gas lines wired into local controller.
      - d. Refrigerant circuits factory-charged with dehydrated air for field charging.
    - 2. Fan Section:
      - a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
      - b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.
      - c. Minimum-adjustable external static pressure 0.32 in-wc; provide for mounting of field-installed ducts.
    - 3. Local Unit Controls:
      - a. Exposed Thermostat: Wall-mounted thermostat wired into controller.
      - b. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.
      - c. Temperature Zones:
        - 1) Single Indoor Unit: Set served space(s) as the local temperature zone.
        - 2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.
    - 4. Return Air Filter:
      - a. Manufacturer's standard, monitored with adjustable static pressure switch.
    - 5. Condensate:
      - a. Built-in condensate drain pan with PVC drain connection for drainage.
      - b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
      - c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.
    - 6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.
  - C. Ceiling-Recessed Cassette, Indoor Units:
-

1. Ceiling mount, 4-way, 2-way, or 1-way supply air flow units with central return air grill, DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
  2. Cabinet Height: Maximum of 10 inches above face of ceiling.
  3. Exposed Housing: White, impact resistant, with washable decoration panel.
  4. Supply Airflow Adjustment:
    - a. Horizontally and vertically adjustable dampers with electronic actuators.
    - b. Four-way distribution field-modifiable to 3-way and 2-way airflow.
    - c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.
  5. Return Air Filter: Manufacturer's standard.
  6. Sound Pressure Range: Between 28 to 33 dB(A) at low speed measured at 5 feet below the unit.
  7. Fan: Direct-drive turbo type, with motor output range of 1/16 to 1/8 hp.
  8. Condensate Pump: Built-in with minimum lift of 21 inches.
- D. Ceiling-Concealed Ducted Indoor Units:
1. Type: Ducted unit with DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
  2. Ducted horizontal discharge and side or back-end return; galvanized steel cabinet.
  3. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
  4. Return Air Filter: Manufacturer's standard.
  5. Sound Pressure: Measured at low speed at 5 feet below unit.
  6. Provide external static pressure switch adjustable for high efficiency filter operation
  7. Condensate Pump: Built-in, with lift of 9 inches, minimum.
  8. Switchbox accessible from side or bottom.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install refrigerant piping in accordance with equipment manufacturer's instructions.
- C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).
- D. Coordinate with installers of systems and equipment connecting to this system.
- E. Refrigerant Piping: See Section 23 23 00 with Section 23 07 19 for insulation, and Section 23 05 29 for hangers and supports unless following specific manufacturer recommendations.
- F. Connect indoor units to condensate piping.

#### **3.3 FIELD QUALITY CONTROL**

- A. Provide manufacturer's field representative to inspect installation prior to startup.

#### **3.4 SYSTEM STARTUP**

- A. Provide manufacturer's field representative to perform system startup.
- B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.
- C. Adjust equipment for proper operation within manufacturer's published tolerances.



### **3.5 CLEANING**

- A. Clean exposed components of dirt, finger marks, and other disfigurements.

### **3.6 CLOSEOUT ACTIVITIES**

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Demonstration: Demonstrate operation of system to Owner's personnel.
  - 1. Use operation and maintenance data as reference during demonstration.
  - 2. Briefly describe function, operation, and maintenance of each component.
- C. Training: Train Owner's personnel on operation and maintenance of system.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of one day of training.
  - 3. Instructor: Manufacturer's training personnel.
  - 4. Location: At project site.

### **3.7 PROTECTION**

- A. Protect installed components from subsequent construction operations.
- B. Replace exposed components broken or otherwise damaged beyond repair.

### **END OF SECTION**

**SECTION 23 82 00**

**CONVECTION HEATING AND COOLING UNITS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Electric unit heaters.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

**1.3 REFERENCE STANDARDS**

**1.4 SUBMITTALS**

- A. Product Data: Provide typical catalog of information including arrangements.
- B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- C. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**PART 2 PRODUCTS**

**2.1 ELECTRIC UNIT HEATERS**

- A. Manufacturers:
    - 1. INDEECO (Industrial Engineering and Equipment Company): [www.indeeco.com/#sle](http://www.indeeco.com/#sle).
    - 2. Modine Manufacturing Company: [www.modineHVAC.com/#sle](http://www.modineHVAC.com/#sle).
    - 3. Marley Engineered Products: [www.marleymep.com/#sle](http://www.marleymep.com/#sle).
  - B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.
  - C. Heating Element Assembly:
    - 1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.
    - 2. Horizontal Projection Units:
      - a. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
  - D. Housing:
    - 1. Suitable for ceiling or high altitude mount using provided hardware appendages.
    - 2. Horizontal Projection Units:
      - a. Construction materials to consist of heavy gauge steel with galvanized, polyester powder coat, or high gloss baked enamel finish.
      - b. Provide with threaded holes for threaded rod suspension.
      - c. Provisions for access to internal components for maintenance, adjustments, and repair.
  - E. Air Inlets and Outlets:
    - 1. Inlets: Provide stamped louvers or protective grilles with fan blade guard.
    - 2. Outlets: Provide diffuser cones, directional louvers, or radial diffusers.
  - F. Fan: Factory balanced, direct drive, axial type with fan guard.
-

- G. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.
- H. Controls:
  - 1. Remoteline-voltage thermostat.
- I. Electrical Characteristics:
  - 1. 480 VAC, three phase, 60 Hz.
  - 2. Disconnect Switch: Factory mount disconnect switch.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that surfaces are suitable for installation.
- B. Verify that field measurements are as indicated on drawings.

#### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's recommendations.
- B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.
- C. Do not damage equipment or finishes.
- D. Unit Heaters:
  - 1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
  - 2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- E. Units with Electric Heating Elements:
  - 1. Install as indicated including electrical devices furnished by manufacturer but not factory installed.
  - 2. Install wiring in accordance with the manufacturer's wiring diagram submittal and Section 26 05 83.

#### **3.3 CLEANING**

- A. After construction and painting is completed, clean exposed surfaces of units.
- B. Vacuum clean coils and inside of units.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.
- D. Install new filters.

#### **3.4 PROTECTION**

- A. Provide finished cabinet units with protective covers during the balance of construction.

### **END OF SECTION**

## SECTION 26 05 10

### COMMON WORK RESULTS FOR ELECTRICAL

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
1. Requirements generally applicable to all electrical Work on the Project, including but not limited to Work specified in Divisions 26, 27, and 28.

##### 1.2 REFERENCES

- A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:
1. 8P8C: An 8-position 8-contact modular jack.
  2. A: Ampere, unit of electrical current.
  3. AC or ac: Alternating current.
  4. AFCI: Arc-fault circuit interrupter.
  5. AHJ: Authority Having Jurisdiction
  6. AIC: Ampere interrupting capacity.
  7. AL, Al, or ALUM: Aluminum.
  8. ASD: Adjustable-speed drive.
  9. ATS: Automatic transfer switch.
  10. AWG: American wire gauge; see ASTM B258.
  11. BAS: Building automation system.
  12. BIL: Basic impulse insulation level.
  13. BIM: Building information modeling.
  14. BMS: Building management system.
  15. CAD: Computer-aided design or drafting.
  16. CATV: Community antenna television.
  17. CB: Circuit breaker.
  18. cd: Candela, the SI fundamental unit of luminous intensity.
  19. CO/ALR: Copper-aluminum, revised.
  20. COPS: Critical operations power system.
  21. CU or Cu: Copper.
  22. CU-AL or AL-CU: Copper-aluminum.
  23. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
  24. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
  25. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
  26. dBm: Decibel absolute power with respect to 1 mW.
  27. DC or dc: Direct current.
  28. DCOA: Designated critical operations area.
  29. DDC: Direct digital control (HVAC).
  30. EGC: Equipment grounding conductor.
  31. ELV: Extra-low voltage.
  32. EMF: Electromotive force.
  33. EMI: Electromagnetic interference.
  34. EMP: Electrical maintenance program (operation and maintenance); electromagnetic pulse (transient analysis).
  35. EPS: Emergency power supply.
  36. EPSS: Emergency power supply system.
  37. ESS: Energy storage system.

38. EV: Electric vehicle.
39. EVPE: Electric vehicle power export equipment.
40. EVSE: Electric vehicle supply equipment.
41. FACU: Fire-alarm control unit.
42. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
43. FLC: Full-load current.
44. ft: Foot.
45. ft-cd: Foot-candle, the antiquated U.S. standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" when the SI unit candela (cd) replaced the international candle; see "fc."
46. FTP: File transfer protocol.
47. GEC: Grounding electrode conductor.
48. GFCI: Ground-fault circuit interrupter.
49. GFPE: Ground-fault protection of equipment.
50. GND: Ground.
51. HACR: Heating, air conditioning, and refrigeration.
52. HDPE: High-density polyethylene.
53. HID: High-intensity discharge.
54. HP or hp: Horsepower.
55. HVAC: Heating, ventilating, and air conditioning.
56. Hz: Hertz.
57. IBT: Intersystem bonding termination.
58. ICT: Information and communications technology.
59. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
60. I/O: Input/output.
61. IP: Ingress protection rating (enclosures); Internet protocol (communications).
62. IR: Infrared.
63. IS: Intrinsically safe.
64. IT&R: Inspecting, testing, and repair.
65. ITE: Information technology equipment.
66. kAIC: Kiloampere interrupting capacity.
67. kcmil or MCM: One thousand circular mils.
68. kV: Kilovolt.
69. kVA: Kilovolt-ampere.
70. kvar: Kilovolt-ampere reactive.
71. kW: Kilowatt.
72. kWh: Kilowatt-hour.
73. LAN: Local area network.
74. lb: Pound (weight).
75. lbf: Pound (force).
76. LCD: Liquid-crystal display.
77. LCDI: Leakage-current detector-interrupter.
78. LED: Light-emitting diode.
79. Li-ion: Lithium-ion.
80. lm: Lumen, the SI-derived unit of luminous flux.
81. LNG: Liquefied natural gas.
82. LP-Gas: Liquefied petroleum gas.
83. LRC: Locked-rotor current.
84. LV: Low voltage.
85. lx: Lux, the SI-derived unit of illuminance equal to one lumen per square meter.
86. m: Meter.
87. MCC: Motor-control center.

88. MDC: Modular data center.
89. MG set: Motor-generator set.
90. MIDI: Musical instrument digital interface.
91. MLO: Main lugs only.
92. MPEG-2: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard for generic coding of moving pictures and associated audio information (ISO/IEC 13818) released in 1995 and used for most over-the-air and satellite broadcast digital television.
93. MPEG-4: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard framework for coding of audio-visual objects (ISO/IEC 14496) released in 1999, with digital rights management and more advanced compression algorithms than MPEG-2.
94. MOV: Metal-oxide varistor.
95. MV: Medium voltage.
96. MVA: Megavolt-ampere.
97. mW: Milliwatt.
98. MW: Megawatt.
99. MWh: Megawatt-hour.
100. N.C.: Normally closed.
101. Ni-Cd: Nickel-cadmium.
102. Ni-MH: Nickel-metal hydride.
103. NIU: Network interface unit.
104. N.O.: Normally open.
105. NPT: National (American) standard pipe taper.
106. OCPD: Overcurrent protective device.
107. ONT: Optical network terminal.
108. PC: Personal computer.
109. PCS: Power conversion system.
110. PCU: Power-conditioning unit.
111. PF or pf: Power factor.
112. PHEV: Plug-in hybrid electric vehicle.
113. PLC: Programmable logic controller.
114. PLFA: Power-limited fire alarm.
115. PoE: Power over Ethernet.
116. POTS: Plain old telephone service. See "public switched telephone network" definition.
117. PSTN: Public switched telephone network.
118. PV: Photovoltaic.
119. PVC: Polyvinyl chloride.
120. pW: Picowatt.
121. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
122. RMS or rms: Root-mean-square.
123. RPM or rpm: Revolutions per minute.
124. SCADA: Supervisory control and data acquisition.
125. SCCR: Short-circuit current rating.
126. SCR: Silicon-controlled rectifier.
127. SPD: Surge protective device.
128. sq.: Square.
129. SWD: Switching duty.
130. TCP/IP: Transmission Control Protocol/Internet Protocol.
131. TEFC: Totally enclosed fan-cooled.
132. TR: Tamper resistant.
133. TVSS: Transient voltage surge suppressor.
134. UL: (standards) UL Standards & Engagement Inc.; (product categories) UL, LLC.
135. UL CCN: UL Category Control Number.
136. UPS: Uninterruptible power supply.
137. USB: Universal serial bus.
138. UV: Ultraviolet.

- 139. V: Volt, unit of electromotive force.
- 140. V(ac): Volt, alternating current.
- 141. V(dc): Volt, direct current.
- 142. VA: Volt-ampere, unit of complex electrical power.
- 143. VAR: Volt-ampere reactive, unit of reactive electrical power.
- 144. VFC: Variable-frequency controller.
- 145. VOM: Volt-ohm-multimeter.
- 146. VoIP: Voice over Internet Protocol.
- 147. VPN: Virtual private network.
- 148. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
- 149. W: Watt, unit of real electrical power.
- 150. WAN: Wide area network.
- 151. Wh: Watt-hour, unit of electrical energy usage.
- 152. WPT: Wireless power transfer.
- 153. WPTE: Wireless power transfer equipment.
- 154. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

- 1. EMT: Electrical metallic tubing.
- 2. EMT-A: Aluminum electrical metallic tubing.
- 3. EMT-S: Steel electrical metallic tubing.
- 4. EMT-SS: Stainless steel electrical metallic tubing.
- 5. ENT: Electrical nonmetallic tubing.
- 6. EPEC: Electrical HDPE underground conduit (thin wall).
- 7. EPEC-A: Type A electrical HDPE underground conduit.
- 8. EPEC-B: Type B electrical HDPE underground conduit.
- 9. ERM: Electrical rigid metal conduit.
- 10. ERM-A: Aluminum electrical rigid metal conduit.
- 11. ERM-S: Steel electrical rigid metal conduit.
- 12. ERM-S-G: Galvanized-steel electrical rigid metal conduit.
- 13. ERM-S-PVC: PVC-coated-steel electrical rigid metal conduit.
- 14. ERM-SS: Stainless steel electrical rigid metal conduit.
- 15. FMC: Flexible metal conduit.
- 16. FMC-A: Aluminum flexible metal conduit.
- 17. FMC-S: Steel flexible metal conduit.
- 18. FMT: Steel flexible metallic tubing.
- 19. FNMC: Flexible nonmetallic conduit. See "LFNC."
- 20. HDPE: HDPE underground conduit (thick wall).
- 21. HDPE-40: Schedule 40 HDPE underground conduit.
- 22. HDPE-80: Schedule 80 HDPE underground conduit.
- 23. IMC: Steel electrical intermediate metal conduit.
- 24. LFMC: Liquidtight flexible metal conduit.
- 25. LFMC-A: Aluminum liquidtight flexible metal conduit.
- 26. LFMC-S: Steel liquidtight flexible metal conduit.
- 27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
- 28. LFNC: Liquidtight flexible nonmetallic conduit.
- 29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
- 30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
- 31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
- 32. PVC: Rigid PVC conduit.
- 33. PVC-40: Schedule 40 rigid PVC conduit.
- 34. PVC-80: Schedule 80 rigid PVC Conduit.
- 35. PVC-A: Type A rigid PVC concrete-encased conduit.
- 36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.

37. RGS: See ERMC-S-G.
  38. RMC: See ERMC.
  39. RTRC: Reinforced thermosetting resin conduit.
  40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
  41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
  42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
  43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
  44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.
- C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:
1. AC: Armored cable.
  2. CATV: Coaxial general-purpose cable.
  3. CATVP: Coaxial plenum cable.
  4. CATVR: Coaxial riser cable.
  5. CI: Circuit integrity cable.
  6. CL2: Class 2 cable.
  7. CL2P: Class 2 plenum cable.
  8. CL2R: Class 2 riser cable.
  9. CL2X: Class 2 cable, limited use.
  10. CL3: Class 3 cable.
  11. CL3P: Class 3 plenum cable.
  12. CL3R: Class 3 riser cable.
  13. CL3X: Class 3 cable, limited use.
  14. CM: Communications general-purpose cable.
  15. CMG: Communications general-purpose cable.
  16. CMP: Communications plenum cable.
  17. CMR: Communications riser cable.
  18. CMUC: Under-carpet communications wire and cable.
  19. CMX: Communications cable, limited use.
  20. DG: Distributed generation cable.
  21. FC: Flat cable.
  22. FCC: Flat conductor cable.
  23. FPL: Power-limited fire-alarm cable.
  24. FPLP: Power-limited fire-alarm plenum cable.
  25. FPLR: Power-limited fire-alarm riser cable.
  26. IGS: Integrated gas spacer cable.
  27. ITC: Instrumentation tray cable.
  28. ITC-ER: Instrumentation tray cable, exposed run.
  29. MC: Metal-clad cable.
  30. MC-HL: Metal-clad cable, hazardous location.
  31. MI: Mineral-insulated, metal-sheathed cable.
  32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
  33. MV: Medium-voltage cable.
  34. NM: Nonmetallic sheathed cable.
  35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
  36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
  37. NPLF: Non-power-limited fire-alarm circuit cable.
  38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
  39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
  40. NUCC: Nonmetallic underground HDPE conduit with conductors.
  41. OFC: Conductive optical fiber general-purpose cable.
  42. OFCG: Conductive optical fiber general-purpose cable.
  43. OFCP: Conductive optical fiber plenum cable.
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44. OFCR: Conductive optical fiber riser cable.
  45. OFN: Nonconductive optical fiber general-purpose cable.
  46. OFNG: Nonconductive optical fiber general-purpose cable.
  47. OFNP: Nonconductive optical fiber plenum cable.
  48. OFNR: Nonconductive optical fiber riser cable.
  49. P: Marine shipboard cable.
  50. PLTC: Power-limited tray cable.
  51. PLTC-ER: Power-limited tray cable, exposed run.
  52. PV: Photovoltaic cable.
  53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
  54. RHW: Thermoset rubber, moisture-resistant cable.
  55. SA: Silicone rubber cable.
  56. SE: Service-entrance cable.
  57. SER: Service-entrance cable, round.
  58. SEU: Service-entrance cable, flat.
  59. SIS: Thermoset cable for switchboard and switchgear wiring.
  60. TBS: Thermoplastic cable with outer braid.
  61. TC: Tray cable.
  62. TC-ER: Tray cable, exposed run.
  63. TC-ER-HL: Tray cable, exposed run, hazardous location.
  64. THW: Thermoplastic, heat- and moisture-resistant cable.
  65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
  66. THHW: Thermoplastic, heat- and moisture-resistant cable.
  67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
  68. TW: Thermoplastic, moisture-resistant cable.
  69. UF: Underground feeder and branch-circuit cable.
  70. USE: Underground service-entrance cable.
  71. XHH: Cross-linked polyethylene, heat-resistant cable.
  72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.
- D. Abbreviations and Acronyms for Electrical Flexible Cord Types:
1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
  2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
  3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
  4. SEOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
  5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
  6. SJEOW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
  7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
  8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
  9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
  10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
  11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
  12. SJOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
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13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
2. Authority Having Jurisdiction (AHJ): An organization, office or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.
3. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
4. "BMS"/ "BMC" / "DDC": Building Management System/Building Management Control system/Direct Digital Control system. All terms are for "control systems operating at low or signal voltage." Terms are used interchangeably.
5. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
6. Code: National, State and Local Regulatory Building and Electrical Codes and standards as applicable, including OSHA requirements, mandatory Energy codes, and AHJ interpretations and requirements.
7. Concealed: Concealed from view and protected from physical contact by building occupants. Where installation is outdoor, protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures.
8. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
9. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
10. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National

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Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.

11. Conduit: A structure containing one or more duct raceways.
12. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
13. Direct Buried: Installed underground without encasement in concrete or other protective material.
14. Documents or Contract Documents: As used herein, refer to the project contract engineering and design drawings, specifications, shop drawings and general conditions and requirements that compose the Electrical Division 26 "Scope of Work". Also included for use with Electrical Division 26 "Documents" are project-related supporting drawings, specifications, etc. These have been prepared primarily for use by the other-than electrical trades and clarify basic project scope for those trades; these will be made available and shall also be used by Division 26 for reference, clarification and as supplementary sources of project information and intent.
15. Drawings or Contract Drawings: As used herein, refer to the project contract drawings.
16. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
17. Duct Raceway: A single enclosed raceway for conductors or cable.
18. Electrical Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
19. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
20. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
  - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  - b. Concrete Box: A box intended for use in poured concrete.
  - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
  - e. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
  - f. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  - g. Device Box: A box with provisions for mounting a wiring device directly to the box.
  - h. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
  - i. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  - j. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  - k. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
  - l. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
  - m. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance

- of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
- n. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
  - o. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  - p. Raised-Floor Box: A floor box intended for use in raised floors.
  - q. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  - r. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
  - s. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
  - t. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
  - u. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
21. Engineer or Engineer of Record: Professional Engineer having responsibility and accountability for the electrical engineering and design of the project.
  22. Exposed: Exposed to view. Where outdoors, subject to outdoor ambient temperatures and weather conditions.
  23. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
  24. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
    - a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
  25. Finished Spaces: Spaces intended to be fitted- or built-out with furnishing, detail products, and/or painted surfaces.
  26. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
  27. Home Run: The portion of a branch circuit between the serving panelboard and the first electrical outlet, lighting fixture, or other electrical load connected to the circuit; or, a dedicated circuit between the serving source or panel and the utilization electrical load.
  28. Jacket: A continuous nonmetallic outer covering for conductors or cables.
  29. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
  30. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
  31. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
  32. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein. Also called "single-line diagram."

33. Owner: As used herein, refers to the property owner, proprietor, administrator or agent as defined in the project contractual agreements.
34. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
35. Protective Device: A device that senses when an abnormal current flow, abnormal voltage potential, or other abnormal electrical waveform exists and then disconnects the affected portion of the circuit from the system. Common protective devices include fuses, circuit breakers, relays, ground-fault circuit interrupters, and arc-fault circuit interrupters.
36. Provide: Furnish, install, wire, and test (or engage and manage an independent testing or commissioning contractor, where specified) ready for service.
37. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
38. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
39. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
40. Scope of Work (or "Work"): All material supply and installations and other labor and appurtenant requirements necessary to complete (and deliver as functional to the satisfaction of the Owner) the electrical installation per the Contract Documents.
41. Sheath: A continuous metallic covering for conductors or cables.
42. Shop Drawings / Vendor Drawings / Submittal Drawings: Documentation, including product drawings, descriptions, instructions, etc., prepared by an equipment manufacturer and/or supplier, as approved by Engineer.
43. Signal voltage or "control voltage": NEC Article 725 remote control, signaling, or power limited circuits which operate at limited voltage (generally 48 volts or less) and/or power levels. "Signal voltage" is typically applied to voltage characteristics of security, access control, sound, intercom, computer, low voltage lighting control and dimming, "smart building" controls, energy management systems, BMS/BMC and like systems, and similar power limited systems and circuits.
44. Specifications or Contract Specifications: As used herein, refer to the project contract specifications.
45. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
46. "VFD" / "VFC" / "VSD": Variable Frequency Drive / Variable Frequency Controller / Variable Speed Drive (For motor(s)). "VFD", "VFC", and "VSD" are used interchangeably.
47. Voice over Internet Protocol (VoIP): Digital telephone packet technology that uses the internet for its transmission medium.
48. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
  - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
  - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

49. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.
50. Work: See "Scope of Work".

### 1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section and all other Sections of Division 26.

### 1.4 GENERAL REQUIREMENTS

- A. All work shall be executed in complete conformance with "Codes/Standards" as defined herein and with Division 1 General Requirements specifications, in addition to Division 26 Electrical Specifications.
- B. Drawings and Specifications form complementary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work may not be specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices, materials, and labor, where necessary for a sound, secure and complete installation. In the event the Drawings and Specifications conflict, the most conservative document shall govern.
- C. Incidental detail that is not shown or specified, but necessary for proper installation and operation shall be included in the work and in these Contractor's estimates, the same as if specified. Locations of all equipment and material shall be adjusted at no extra cost to the Owner, to accommodate the work interferences anticipated and/or encountered. Prior to installation, determine the exact route and location of each raceway and piece of equipment to minimize conflicts with other trades.
- D. Information and components shown on one-line or riser diagrams but not shown on plans, and vice versa, shall be provided as if expressly required on both.
- E. Contractor shall provide systems and components that are fully complete, operational, and suitable for the intended use. All material and all work which may be reasonably implied as being incidental to the work of this section or other applicable sections shall be furnished at no extra cost. In situations where insufficient information exists in the contract documents to precisely describe a certain component or subsystem, or the routing or placement of a component or its coordination with other building elements, the contractor shall include in their bid and scope the specific components or subsystems with all parts necessary for the intended use.

### 1.5 SCOPE OF DIVISION 26 WORK

- A. Scope of Division 26 work shall include furnishing all labor, supervision, materials, equipment, incidentals, and work required to make ready for use complete functional electrical systems as shown on the Drawings and specified herein.
- B. Contractor or his authorized representative shall, before preparing his proposal, visit all areas of the existing site, buildings, and structures in which work under this Section is to be performed, and carefully inspect the present installation. The submission of the proposal by this Contractor shall be considered evidence that he or his representative has visited the site and noted the locations and conditions under which the work will be performed and that he takes full responsibility for a complete knowledge of all factors governing his work.
- C. The work shall include functional verification of all equipment and wiring at the completion of work and making any minor corrections, changes, or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.

- D. Where applicable, identify and verify field conditions of all existing underground structures and utilities, including electrical, mechanical, and civil piping.
- E. There may occur situations where specified wire gauges, materials and /or quantities of conductors conflict with the lugs of the equipment to which they are to be connected. In such cases, Contractor shall either provide approved interface connectors or coordinate a solution with the equipment manufacturer or vendor.
- F. Include electrical power utility, conduit, wiring, and wiring termination for all equipment furnished under Division 26 and other Divisions. Included in scope are electrical supply to manufacturing equipment, kitchen appliances, laboratory equipment, shop machines, prefabricated and/or modular furniture, millwork, laundry appliances, architectural appurtenances, dewatering, rain harvesting, energy harvesting/reducing systems, pumps, site utilities, grounds maintenance equipment, and similar equipment.
- G. Unless noted otherwise, scope includes a complete conduit-raceway and/or cable tray/trough system including wiring for nominal 110-120 volt or greater "service" or "supply" or "miscellaneous" power for all electronic/technology and similar system devices and units requiring such supply power from the building infrastructure. Such electronic/technology systems may be furnished under separate Divisions of the Specifications, unless noted otherwise. Coordinate requirements with the electronic/technology system(s) Supplier(s).
- H. Unless noted otherwise, Division 26 Contractor shall furnish and install a complete empty conduit-raceway and/or cable tray/trough system for signal/control/power-limited power wiring (12V, 24V, 48V, etc.), and for related control, signaling, monitoring, data highways, fiber-optic systems, data acquisition, Local Area Networks, Ethernet, SCADA, BacNET, etc., as required for all electronic/technology and similar systems and devices. Include all raceways, rough-ins, back boxes, supports, cabinets, etc. The supply, installation, and termination of such systems and devices and their required wiring shall be under separate Divisions of Specifications, unless noted otherwise.  
Review the raceway layout with Owner and technology systems designer/installer, prior to installation, to insure raceway compatibility with the systems and materials being furnished. Install pull strings in all empty conduits.
- I. Unless noted otherwise, include a complete conduit raceway system for all special and/or system cables furnished by electronic alarm, fire alarm, signaling, data, and similar system suppliers. Review the raceway layout with Owner and supplier, prior to installation, to insure raceway compatibility with the systems and materials being furnished.
- J. Where applicable, provide all electrical work associated with the relocation of equipment for existing and new facilities, including disconnection of all existing wiring and conduits and provision of new wiring from the point of electrical supply and conduit to the relocated equipment.
- K. Excavation and backfilling, including gravel or sand bedding for underground electrical work is included in Division 26. Repair and restore existing site and structures to same condition as encountered prior to start of electrical excavation and backfilling work.
- L. Concrete work, including manholes, handholes, vaults and concrete electrical duct and conduit encasement and electrical equipment and light pole foundations and pads, is included in Division 26.
- M. Contractor shall provide all work for duct banks and underground conduits, including but not limited to excavation, concrete, concrete compaction, forming, conduit, reinforcement, grounding and bonding, backfilling, grading, and disturbed area seeding. Also include all materials and labor required for pipe and conduit jacking, tunneling and boring for underground cable conveyance, trenchless excavation, etc., where required. All work shall be in accordance with this and all other applicable Divisions of these Specifications.

## 1.6 INTERPRETATION OF CONTRACT DOCUMENTS

- A. Drawings are intended to outline the scope of work required and are not intended to be installation drawings. Drawings are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component nor do they show the exact routings. The purpose of the Drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the Contractor shall provide all other components and materials necessary to make the systems fully complete and operational. The Drawings do not show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. The Drawings are not intended to show exact locations of equipment or conduit runs. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be determined in field by the Contractor, during construction, after coordination with the Owner and/or his designated representative and approval by the Engineer. Obtain in the field all information relevant to the placing of electrical work, and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- C. Unless specifically stated to the contrary, no measurement of an electrical drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electrical drawings are subject to measurements of adjacent and previously completed work. Measurements shall be performed prior to the actual installation of equipment.
- D. Where installation of new, active, conduit runs are called for or indicated in the Contract Documents, in locations which will become "inaccessible" after installation is complete, (such as underground, under floor, or in concrete encasement, concrete slabs, or above/behind ceilings/walls lacking access, or similar application), Contractor shall furnish and install spare conduits of similar type and size, for the entire "inaccessible" part of such conduit runs. The quantity of additional spare conduits shall be such that an equivalence equal to 20% or more of the active conduits is achieved. Such spare conduits will generally not appear on the Drawings, but shall be included.
- E. Dimensions indicated on the Drawings related to electrical equipment locations and/or clearances (relative to walls, column lines, other equipment, etc.) are generally minimum clear dimensions to be maintained as per Code, AHJ, project and/or operating requirements. Such dimensions shall be maintained or exceeded, but not reduced, regardless of actual equipment sizes, which will only be determined after approval of project specific manufacturer's drawings. Concrete pads, vaults, structures, etc., for electrical equipment, where dimensioned on the Drawings, are estimated dimensions based on typical catalog sizes of electrical equipment on which the design is based. Such dimensions shall be adjusted by Contractor if/as necessary based upon project specific approved manufacturer's drawings.
- F. Conduit and wiring between electrical "field" utilization equipment, loads, motors, instrumentation, etc., and their respective "source" switchgear, motor control center, panelboard, PLC, termination cabinet, etc., are generally shown on the Drawings as "homeruns". Similarly, conduit and wiring between panels may be shown as "homeruns". Contractor's scope, under this Section, shall include determination of the most suitable physical routing of such "homeruns", considering Owner preferences, building layouts, existing conditions, aesthetics, future accessibility, ease of installation, interferences, etc. Where multiple "homeruns" of instrumentation "digital control (1/0, on/off, open/closed, etc.)" or modulating "analog control (4-20 mA DC)" or similar wiring run from the same "field" location or from the same panel to the same "source" location, Contractor may replace multiple wiring conduits with larger (common) conduits so as to provide an economical and practical installation. However, "digital" and "analog" or similar "category" of wiring shall each be kept segregated and not share the same (common) conduits with any other wiring "categories". Also, Contractor shall not combine power wiring into larger (common) conduits except in limited situations as specifically allowed by the Contract Documents.



- G. Electrical loads (KVA, KW, Horsepower, Amperes, etc.) and wiring requirements indicated on the electrical Drawings are estimates representative of the "basis of design" standard electrical, mechanical and building equipment. Electrical equipment ratings, bus ratings, circuit wire sizes, circuit wire quantities, conduit sizes, conduit quantities and overcurrent protection device ratings indicated on the Drawings are based on such equipment. Contractor is advised that prior to installation he must compare indicated electrical equipment ratings, wire sizes and quantities, conduit sizes and quantities and overcurrent protective device ratings versus approved shop drawings of actual equipment being furnished. Contractor shall provide electrical materials conforming to the requirements of the actual equipment being furnished (except where otherwise required by Code), reflecting increased ratings, wire sizes and quantities, conduit sizes and quantities and overcurrent protective device ratings where required. Overcurrent protective device ratings shall be decreased if required to match actual equipment requirements and/or manufacturer's recommendation. Other electrical ratings, wire sizes and quantities and conduit sizes and quantities shall not be decreased to less than that indicated on the electrical Drawings.
- H. Equipment short circuit interrupting, fault, and/or withstand ratings are indicated on the Drawings and/or Specifications. These ratings equal or exceed design Engineer's determination of approximate short circuit levels based on standard data available at the time of design. Such determinations may reflect "worse condition" situations and allow for unknown/unavailable/unreliable data at time of design. Such data typically includes Utility Company available fault levels, service transformer ratings, type, location, etc. Also note that Engineer's design may indicate equipment with higher ratings than required by specific application, in cases where there is a desire for standardization of equipment throughout the project. Contractor shall furnish equipment meeting such indicated minimum ratings. In cases where short circuit studies completed subsequent to system design indicate that higher ratings are appropriate, such situations shall be submitted to Engineer for resolution.
- I. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect and/or Engineer for review and approval.
- J. Minimum wire sizes shall be as indicated, except that Contractor shall increase wiring sizes for feeders and branch circuits, to limit voltage drop to 2 percent and 3 percent respectively, where necessary based on circuit lengths.
- K. Unless specifically noted or permitted, all electrical equipment shall be fully rated. Full ratings shall include full fault duty, short-circuit interrupting and short-circuit withstand ratings, based on the actual available calculated maximum fault, not based on a fault level theoretically reduced through application of an upstream series-connected fault-limiting or reducing device; the use of equipment rated or de-rated for use in such "series-rated or series-connected" applications shall not be permitted.
- L. The Contract Drawings, as clarified above, are intended for general use to outline the scope of work only; they are not intended to be installation drawings. Accordingly, Contractor is advised that (even though not specifically indicated on the Drawings) he shall follow NEC throughout, including Article 300. Portions of this Article relate to installations being such that spread of fire and products of combustion are eliminated or mitigated. As described and specified, use third party approved fire seals, through-penetration firestops, fire rated padding, fire-rated sealants and like products in order to comply. In addition, maintain minimum of 24" horizontal separation between (outlet) boxes on opposite sides of the same fire rated wall. Note that this spacing is generally NOT indicated to scale on the Contract Drawings. Refer to UL Guide Information for electrical equipment (The White Book) for application information.
- M. Lighting Control Systems - Lighting control system architecture and components vary significantly between manufacturers and between projects. Systems may employ full automation, computer programs, overrides, occupancy monitoring, daylight harvesting, energy conservation, dimming, scene control, etc. The Contractor is advised that the Contract Drawings will typically indicate a control scheme and/or control matrix intended to clarify the intended performance of the lighting control system on a room-by-room or space- by-space basis. In addition to this, the Drawings will
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often indicate the type of control devices in a particular room or space which are intended to be employed as an aid when developing the lighting control system design. A system design of sufficient detail to be installed in the field will be particular to a manufacturer, and so it is expected that the Contractor shall furnish a complete and detailed manufacturer-specific hardware and wiring design, in accordance with Contract Drawings and Specifications for Engineer's approval.

### 1.7 ELECTRICAL DEMOLITION

- A. Electrical Demolition: included in Contractor's scope is all required electrical demolition to fully support General Project Demolition by other trades in order to demolish existing building or similar spaces and/or existing system and device installations. Refer to the Contract Documents for demolition overall scope intent, subject to the following general criteria:
- B. Disconnect and remove all electrical items within the demolition space and/or scope that are not intended for retention and/or subsequent use. Provide Owner with right of first refusal. Dispose of removed materials off-site in an AHJ approved place and manner. For equipment of other trades having integral electrical components (multi-stage air handler unit, for example), disconnect and make safe all existing electrical services, wires, conduits, etc. so as to enable entire unit removal by other trades.
- C. Unless otherwise noted, remove all circuits, including wiring, raceways, connectors and all appurtenances from their termination point at the utilization equipment completely back to their electrical point of power source or supply.
- D. Provide materials and make safe systems and circuits which are partially demolished. Include supports, conduit fittings and boxes, raceway closures, wire taping and wire-nuts, etc., such that the remaining partial system or circuit is electrically and mechanically complete and code compliant. Include work and materials to assure electrical bonding and grounding per code.
- E. Circuits, systems and equipment that are intended to ultimately remain active but which are in or pass through spaces undergoing Demolition, shall be identified by Contractor, considering Owner's input and concurrence. Such installations shall be left intact to the extent required; relocate in-kind wherever necessary where conflicts with the intended use of the demolished space arise.
- F. Contact owner for direction if situations arise regarding hazardous materials, waste, asbestos, PCB transformers, etc.
- G. Lock-out, tag-out, and clearly identify all remaining circuit breakers, switches, etc. that become "spare" as a result of Demolition activities.

### 1.8 COORDINATION WITH UTILITY COMPANIES

- A. Where applicable it is intended that Contractor coordinate with the Electric Utility Company, to the extent necessary and as intended by the Contract Documents, so that an appropriate, complete and reliable electrical service or supply is provided for this project.
- B. Where applicable, the Contractor shall be responsible for receiving and handling Electric Utility Company costs and invoices that are assessed the Owner for the installation of the permanent electric service. It is the responsibility of the Contractor to obtain those costs from the Utility Company and include them in Contractor's own bid and/or invoice, where applicable. Unless otherwise indicated or negotiated, Contractor shall include in his project scope and bear responsibility for coordination and completion of all requisite work as required by Utility including the following:
  - 1. Project service transformer pad, vault, and/or work to enable/facilitate Utility interface or "point-of-tie-in" interface. Include supply of service transformer and/or installation where so directed by Utility and/or Contract documents.
  - 2. Determination and implementation of Utility requirements, standards, codes, regulations, and locations of major equipment, including project service transformer(s).
  - 3. Empty conduit with pull wire or conduit sleeves between project service transformer(s) and Utility primary voltage point-of-tie-in, as per Utility. Include primary wiring where so directed.

4. Utility requirements for metering and installation.
  5. Complete conduit and wiring and termination of secondary voltage conductors between the project service transformer(s) and the project service entrance or otherwise indicated equipment.
  6. Concrete encasement of primary and/or secondary conductors when required by Utility and/or called for on the Contract Drawings.
  7. Utility required clearances, grounding, signage, and all miscellaneous appurtenances, including fencing if required. Include fence grounding and bonding per NEC, NESC, and/or Utility Company requirements.
- C. Contractor shall complete applicable Utility forms and comply with and respond to Utility requests for information. Such are as related to, but not limited to, sizes and types of new electrical loads, existing loads to remain, existing loads to be deleted, anticipated load diversity/demand, generators, and size, rating and characteristics of Owner's new and existing electrical equipment, etc., to the extent required by the Utility Company. Intent is that Utility Company will, from such coordination with Contractor, be able to finalize Utility's incoming electrical service ratings and details, service transformer(s) ratings and details, and proper interconnection with Owner's equipment.
- D. Interface with the services provided by the Telephone, Data, and other Systems Utility Companies/Service Providers. Unless indicated otherwise, furnish and install 4-foot x 8 foot x 3/4 inch painted (fire retardant paint) plywood backboard at designated location within the site and two 4-inch underground non-metallic conduits with pull-wire between the backboard and each point of interface as required. Run two separate 4-inch conduits for each service.

#### 1.9 COORDINATION WITH OTHER TRADES

- A. Provide complete coordination with other contractors. Division 26 Contractor shall coordinate with other contractors regarding each others equipment and equipment submittals and shall obtain all relevant submittals and incorporate/accommodate all resulting variances into the design and installation.
- B. Where applicable, include complete electrical heat tracing system for all piping which is indicated as electrically traced on the project Piping and Instrumentation Diagrams and/or project Mechanical Drawings/Specifications. Contractor shall employ the services of an approved heat-tracing product manufacturer to provide detailed system design. System shall protect piping and appurtenances against freezing or shall maintain temperatures, as required. System shall include code-compliant, environmentally suitable and properly sized self-regulating heat tracing cables, and all related requisite power source and control equipment, panels, transformers, circuitry, contactors, controls, etc. necessary for a complete and functional heat tracing system. Installation and testing shall be performed by the contractor.
- C. Include nominal 110-120 volt or greater power and control wiring, service, connections, and appropriate raceway for all equipment and devices requiring such power and/or control. Include wiring in conduit for heating, ventilating, air conditioning (HVAC), mechanical and/or plumbing equipment; building equipment, process equipment, including electronic systems (fire alarm, security, life safety, mass notification and similar), and appurtenances furnished under all Divisions of these Specifications, or provided by Owner. Include power wiring for all air handlers, fans, condensing units, PIUs, terminal units, fan coil units, variable air volume units (VAVs), dampers, louvers, motorized operators, valves, elevators, motorized doors, powered doors, gates, operators, cranes, pumps, compressors, tools, controllers, packaged equipment, manufacturing equipment, and any and all other similar building or process equipment covered by this Division and other Divisions Drawings and/or Specifications.
- D. Provide power and control wiring and conduit from power source to equipment physical locations and provide wiring terminations as required both at the source and at the equipment. If/as required, provide transformers, rectifiers, and/or inverters to match the source voltage to the electrical utilization characteristics of the load or system. Provide disconnects, fusing, enclosures, etc., to make installation Code compliant.

- E. Unless noted otherwise, excluded from Division 26 responsibility are conduit and wiring for other Division furnished "HVAC Controls", "Building Management Systems (BMS)", or "Direct Digital Control (DDC) Systems" controls that require/operate at only "signal voltage level" (typically 48 volts or less). Note that certain projects may require Electrical Contractor to furnish and install empty conduit (or similar) with pull-strings, for such systems.
- F. Conduit, wire, field connections, and installation for all motors, motor controllers, variable frequency drives (VFDs), control devices, control panels, and "packaged" equipment furnished under Division 26 or other Divisions of these Specifications are included in Division 26 scope.
- G. Contractor shall review the submittal/shop drawings for all electrically operated and/or electrically connected equipment being furnished under all other Divisions of the Specifications for this project. Unless specified otherwise, Contractor shall provide raceway, wire and interconnection for all materials, devices, components, systems and packages requiring "field wiring", to the extent clarified in the paragraphs herein. Where applicable, Contractor shall make electrical interconnections per manufacturer's requirements. This includes, but is not limited to, devices/components that are parts of "packages" but which are shipped separately and require field interconnection. Also, Contractor shall identify terminals and prepare drawings or wiring tables to extent necessary to enable interconnections.
- H. Coordinate arrangement, mounting, and support of equipment and raceways:
  - 1. To maintain maximum headroom; all piping, duct, conduit and associated components to be as tight as possible to underside of structure to provide for ease of disconnecting the equipment with minimum interference to other installations. (Exceptions to this general rule must be followed. For example, where Code requires a minimum distance below structural roof to electrical raceway so as to mitigate effects of thermal radiation.)
  - 2. To allow right of way for piping installed at required slope.
  - 3. To allow connecting raceways, cables, wireways, cable trays, and busways to be clear of obstructions and of the working and access space of other equipment.
- I. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structure components as they are constructed.
- J. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- K. Prior to installation of exposed material and equipment (including access panels) in finished spaces, review Architectural Drawings for desired locations and where not definitely indicated, request information from Architect.
- L. Coordinate with mechanical and plumbing piping routes to ensure that liquid-conveying piping systems are not installed above interior electrical or electronic equipment, including but not limited to: switchgear, switchboards, panelboards, motor control centers, control panels, motor and equipment disconnects and starters, variable frequency drives, rectifiers, electrical enclosures, transformers, uninterruptable power supplies, telephone switching equipment, data communications switching and routing equipment, and fire alarm system cabinets.
- M. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades. Systems shall be run parallel with or perpendicular to major architectural and structural building elements.

#### **1.10 SEISMIC AND WIND-RESTRAINT REQUIREMENTS**

- A. Conform to the requirements indicated in Code and/or on the structural and/or other Contract Documents, where applicable.
- B. It shall be the responsibility of the equipment manufacturers and suppliers along with the contractor to conform to the seismic and wind-restraint design requirements based on the project's seismic

classification and/or codes and/or contract documents.

- C. All electrical equipment enclosures, anchors, raceways, supports, lighting, trays, etc. shall utilize earthquake resistant supporting systems as required by the project's seismic classification and/or Codes and/or Contract Documents.
- D. Electrical distribution, generating, and power control equipment shall be labeled by the equipment manufacturer as "seismic qualified". This labeling shall be indicative that representative samples of the same equipment have been tested and found to meet or exceed the seismic requirements of the applicable code for the applicable project seismic classification. Contractor shall install such equipment in accordance with these codes and the manufacturer's recommendations. Large equipment seismic labeling applies to panelboards, switchboards, motor control centers, busway, transfer switches, switchgear, transfer switches, UPS and similar systems, battery installations, transformers, power centers, metal clad or metal enclosed switchgear, load centers, safety switches, enclosed control assemblies, and generators and generator fuel delivery and storage systems.

### 1.11 EXISTING FACILITY COORDINATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Owner's written permission.
  - 3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
    - a. Exercising generators.
    - b. Emergency lighting.
    - c. Elevators.
    - d. Fire-alarm systems.
  - 4. Arrange to provide temporary emergency and standby electrical power so facility may remain occupied during the outage in accordance with requirements specified in Section 015000 "Temporary Facilities and Controls." Coordinate power requirements with Owner.
- B. Interruption of Existing Internet Service: Do not interrupt internet service to facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of internet service.
  - 2. Do not proceed with interruption of internet service without Owner's written permission.
- C. Interruption of Existing Fire-Alarm System: Do not interrupt fire-alarm system to facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of fire-alarm system.
  - 2. Do not proceed with interruption of fire-alarm system without Owner's written permission.

### 1.12 PREINSTALLATION MEETINGS

- A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
  - 1. Electrical installation schedule.
  - 2. Status of power system studies.
  - 3. Value analysis proposals and requests for substitution of electrical equipment.
  - 4. Utility work coordination and class of service requests.
  - 5. Commissioning activities.
- B. Communications and Electronic Safety Preconstruction Conference: Schedule conference with Architect and Owner not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:

1. Installation schedule for communications systems.
2. Installation schedule for security, fire-alarm, and other life-safety systems.
3. Value analysis proposals and requests for substitution of communications equipment.
4. Value analysis proposals and requests for substitution of electronic safety and security equipment.
5. Monitoring services work coordination and monitoring service requests.
6. Utility services work coordination and monitoring service requests.
7. Commissioning activities.

### 1.13 SEQUENCING

- A. Conduct and submit results of power system studies before submitting product data and Shop Drawings for electrical equipment.

### 1.14 ACTION SUBMITTALS

- A. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.
- B. Coordination Drawings for Ceiling Areas: Where indicated on drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Suspended ceiling components.
  2. Structural members to which equipment and suspension systems will be attached.
  3. Size and location of access panels on ceilings.
  4. Elevation, size, and route of sprinkler piping.
  5. Elevation, size, and route of plumbing piping.
  6. Elevation, size, and route of ductwork.
  7. Elevation, size, and route of cable tray.
  8. Elevation, size, and route of conduit.
  9. Elevation and size of wall-mounted and ceiling-mounted equipment.
  10. Access panels.
  11. Sprinklers.
  12. Air inlets and outlets.
  13. Control modules.
  14. Luminaires.
  15. Communications devices.
  16. Speakers.
  17. Security devices.
  18. Fire-alarm devices.
  19. Indicate clear dimensions for maintenance access in front of equipment.
  20. Indicate dimensions of fully open access doors.
- C. Coordination Drawings for Cable Tray Routing: Reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Elevation, size, and route of cable trays.
  2. Relationships between components and adjacent structural, electrical, and mechanical elements.
  3. Vertical and horizontal offsets and transitions.
  4. Elevation and size of sleeves for wall, ceiling, and floor cable penetrations.
  5. Elevation of ceilings and size of ceiling tiles.
  6. Locations of access panels on ceilings.
  7. Locations where cable tray crosses or parallels sprinkler piping.
  8. Locations where cable tray crosses plumbing piping.

9. Locations where cable tray crosses or parallels ductwork.
  10. Locations of access panels on ductwork.
  11. Locations where cable tray crosses conduit.
  12. Items blocking access around cable trays, including the following:
    - a. Light fixtures.
    - b. Speakers.
    - c. Fire-alarm devices.
    - d. Power outlets.
    - e. Wall-mounted equipment.
    - f. Equipment racks.
    - g. Furniture.
    - h. Door swings.
    - i. Building features.
  13. Indicate clear dimension between cable tray and walls or obstructions that are closer than 10 ft.
  14. Highlight locations where cable tray is greater than 3 ft above ceilings. Explain how personnel access will be accommodated for cable tray maintenance.
- D. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Structural members in paths of conduit groups with common supports.
  2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- E. Coordination Drawings for Bus Assembly Routing: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Scaled bus-assembly layouts and relationships between components and adjacent structural, mechanical, and electrical elements.
  2. Vertical and horizontal enclosed bus-assembly runs, offsets, and transitions.
  3. Clearances for access above and to the side of enclosed bus assemblies.
  4. Vertical elevation of enclosed bus assemblies above the floor or bottom of structure.
  5. Support locations, type of support, and weight on each support.
  6. Location of adjacent construction elements, including luminaires, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.
- F. Coordination Drawings for Large Equipment Indoor Installations:
1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
  2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
    - a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
    - b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.
    - c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.
  3. Reflected ceiling plans for entry floor and floor where equipment is located, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
    - a. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways, busways, and seismic bracing.
    - b. Location of lighting fixtures, sprinkler piping and sprinklers, ducts and diffusers, and other obstructions, indicating available overhead clearance.
-

- c. Dimensioned working clearances and dedicated areas above and around electrical equipment where foreign systems and equipment are prohibited.
- G. Coordination Drawings for Large Equipment Outdoor Installations:
  - 1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
    - a. Fences and walls, dimensioned concrete bases, outlines of equipment, conduit entries, and grounding and bonding locations.
    - b. Indicate clear dimensions for fence gates and wall openings.
    - c. Indicate depth and type of ground cover, and locations of trees, shrubbery, and other obstructions in access path.
    - d. Indicate clear height below tree branches, overhead lines, bridges, and other overhead obstructions in access path, or where cranes and hoists will be needed to handle large electrical equipment.
    - e. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways.
    - f. Dimensioned working clearances and dedicated areas around electrical equipment.
- H. Coordination Drawings for Duct Banks:
  - 1. Show duct profiles and coordination with other utilities and underground structures.
  - 2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

#### 1.15 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
  - 1. Submission of power system studies.
  - 2. Submission of specified coordination drawings.
  - 3. Submission of action submittals specified in Division 26.
  - 4. Orders placed for major electrical equipment.
  - 5. Arrival of major electrical equipment on-site.
  - 6. Preinstallation meetings specified in Division 26.
  - 7. Utility service outages.
  - 8. Utility service inspection and activation.
  - 9. Mockup reviews.
  - 10. Closing of walls and ceilings containing electrical Work.
  - 11. System startup, testing, and commissioning activities for major electrical equipment.
  - 12. System startup, testing, and commissioning activities for emergency lighting.
  - 13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  - 14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
  - 15. Requests for special inspections.
  - 16. Requests for inspections by authorities having jurisdiction.
- B. Installation Schedule for Communications Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of the communications Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
  - 1. Submission of specified coordination drawings.
  - 2. Submission of action submittals specified in Division 27.
  - 3. Orders placed for major equipment.
  - 4. Arrival of major equipment on-site.
  - 5. Preinstallation meetings specified in Division 27.
  - 6. Telephone and internet service outages.
  - 7. Telephone and internet service inspection and activation.
  - 8. Mockup reviews.



9. Closing of walls and ceilings containing the communications Work.
  10. System startup, testing, and commissioning activities for communications equipment.
  11. System startup, testing, and commissioning activities for the Work specified in other divisions that depends on the Work specified in Division 27.
  12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  13. Requests for special inspections.
  14. Requests for inspections by authorities having jurisdiction.
- C. Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of security, fire-alarm, and the other life-safety Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of specified coordination drawings.
  2. Submission of action submittals specified in Division 28.
  3. Orders placed for major equipment.
  4. Arrival of major equipment on-site.
  5. Preinstallation meetings specified in Division 28.
  6. Security and fire-alarm system outages.
  7. Security and fire-alarm system inspection and activation.
  8. Mockup reviews.
  9. Closing of walls and ceilings containing the security and fire-alarm Work.
  10. System startup, testing, and commissioning activities for security and fire-alarm equipment.
  11. System startup, testing, and commissioning activities for fire-alarm interfaces with the Work specified in other divisions.
  12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  13. Requests for special inspections.
  14. Requests for inspections by authorities having jurisdiction.
- D. Welding certificates.
- E. Seismic Performance Certificates: Provide special certification for designated seismic systems as required to meet requirements specified in Section 018123 "Facility Seismic and Wind Criteria" for all designated seismic systems identified on the Drawings or in the Specifications.
1. Include the following information:
    - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
    - c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
    - d. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
    - e. Equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the basis-of-design seismic criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
    - f. Equipment manufacturer's written certification that components with hazardous contents maintain containment following the basis-of-design seismic criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
    - g. Evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.
- F. Wind Performance Certificates: Provide special certification for systems and components designated on the Drawings or in the Specifications to be subject to high wind exposure and impact damage.
1. Include the following information:

- a. Provide equipment manufacturer's written certification for each designated system and component, stating that it will remain in place and operable following the design wind event and comply with requirements of authorities having jurisdiction.
  - b. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction.
- G. Qualification Statements:
1. For structural professional engineer.
  2. For electrical professional engineer.
  3. For welder.
  4. For ERMC-S-PVC raceway Installer.
  5. For medium-voltage cable Installer.
  6. For medium-voltage duct Installer.
  7. For medium-voltage equipment Installer.
  8. For lightning protection system Installer.
  9. For power quality specialist.
  10. For medium-voltage and low-voltage electrical testing agency and on-site electrical testing supervisor.
  11. For structural testing and inspecting agency.
  12. For communications design professional.
  13. For communications cable Installer.
  14. For communications testing agency and on-site communications testing supervisor.
  15. For fire-alarm professional engineer.
  16. For fire-alarm cable Installer.

#### 1.16 CLOSEOUT SUBMITTALS

- A. RECORD DOCUMENTS
1. Record Drawings are specified in Division 01 Section "Project Record Documents."
  2. The Contractor shall keep a detailed up-to-date record, of the manner and location in which installations are actually made, indexing each feeder, pull box and protective device. Record documents are to reflect all changes in work including change orders, field directives, addenda from bid set of Contract Documents, request for information responses, etc. Upon completion of the project, the Contractor shall modify the project electronic drawing and specification files to incorporate this information. Modified documents shall be turned over to the Owner in both electronic and hard paper copy formats. Record drawings shall also include:
    3. Locations of buried conduit and similar items. Include burial depth.
    4. Field changes of dimension or detail.
    5. Details not on original contract drawings.
    6. Changes to circuit numbers.
    7. Junction box locations and conduit runs, with trade sizes indicated, for lighting, power, and electrical systems installed.
    8. Final panel schedules on drawings matching Contract Drawing size.
- B. Operation and Maintenance Data:
1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device installed as part of the Project.
  2. Include the following information:
    - a. Manufacturer's operating specifications.
    - b. User's guides for software and hardware.
    - c. Schedule of maintenance material items recommended to be stored at the Project site.
    - d. Detailed instructions covering operation under both normal and abnormal conditions.
    - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
    - f. List of load-current and overload-relay heaters with related motor nameplate data.
    - g. List of lamp types and photoelectric relays used on the Project, with ANSI and manufacturers' codes.

- h. Manufacturer's instructions for setting field-adjustable components.
  - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
  - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
  - k. Exterior pole inspection and repair procedures.
- C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:
- 1. Software operating and upgrade manuals.
  - 2. Names, versions, and website addresses for locations of installed software.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.
  - 5. Testing and adjusting of panic and emergency power features.
  - 6. For lighting controls, include the following:
    - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
    - b. Operation of adjustable zone controls.
- D. Software:
- 1. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.

### 1.17 MOCKUPS

- A. Simple Mockups for Coordinating Accessibility of Electrical Devices around Fixed Furnishings and Equipment:
- 1. Build simple mockups using sample fixtures and representative materials for verification of general arrangement, actual dimensions, and aesthetics of lighting fixtures installed in or attached to prefabricated assemblies provided under other Divisions, included but not limited to, prefabricated metal canopy structures, pre-fabricated engineered metal building truss systems (for high bay lighting), and linear/tape-style lighting integrated into window mullions, casework, or similar architectural features, prior to fabrication and installation of Work. Depict products from all Divisions requiring coordination, including, but not limited to, fixed furnishings, casework, outlet covers and plates, HVAC controls, exposed raceway, exposed plumbing, equipment, and signage.
- B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

### 1.18 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.
- D. UL 62368-1 - Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements; Current Edition, Including All Revisions.

## PART 2 PRODUCTS

### 2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
- 1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
-

2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

## **2.2 SUBSTITUTION LIMITATIONS FOR COMMUNICATIONS EQUIPMENT**

- A. Substitution requests for communications equipment will be entertained under the following conditions:
  1. Substitution requests may be submitted for consideration prior to the Communications Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Communications Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

## **2.3 SUBSTITUTION LIMITATIONS FOR ELECTRONIC SAFETY AND SECURITY EQUIPMENT**

- A. Substitution requests for electronic safety and security equipment will be entertained under the following conditions:
  1. Substitution requests may be submitted for consideration prior to the Electronic Safety and Security Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Electronic Safety and Security Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

## **PART 3 EXECUTION**

### **3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION**

- A. Comply with NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items, unless otherwise indicated.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Yield to piping systems installed at a required slope.
- F. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

### **3.2 CONCRETE PADS**

- A. Construct concrete bases of dimensions indicated but not less than 2 inches (100 mm) larger in both length and width directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Height of base shall be as indicated, but not less than 3 inches.

- B. For pads supporting equipment requiring minimum front working space or clearance as defined in the NEC, pad shall be flush with the front of the equipment. This requirement may be waived if special, written permission is granted by the AHJ.
- C. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete, unless noted otherwise. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Anchor equipment to concrete base.
- E. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- F. Install anchor bolts to elevations required for proper attachment to supported equipment.
- G. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
- H. Provide raised concrete pads for all floor mounted electrical equipment, including but not limited to, switchboards, transformers, motor control centers, transfer switches, lighting control/dimmer cabinets, and large motor controllers.

### **3.3 FIREPROOFING**

- A. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, prior to start of spray fiber work.
- B. Piping and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.
- C. Patching and repairing of fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for extra cost to Owner.

### **3.4 MAJOR ELECTRICAL EQUIPMENT**

- A. Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the structure.
- B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passing through such restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to ensure that the tilting does not impair the functional integrity of the equipment.

### **3.5 INSTALLATION ONLY ITEMS**

- A. Where this Contractor is required to install items which are purchased and/or furnished by others, he shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This contractor shall be responsible for:
  - B. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
  - C. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
  - D. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this Contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted, this Contractor shall be fully responsible for

the complete reconditioning or replacement of the damaged items.

### **3.6 PAINTING**

- A. Furnish one can of aerosol-free touch-up paint for each different color factory finish which is to be the final finished surface of the product.

### **3.7 CLEANING**

- A. Cleaning shall be performed prior to equipment being energized.
- B. Raceways:
  - 1. Cover all raceway openings prior to the installation of conductors to prevent dirt, moisture, and other debris from entering the raceways.
  - 2. Before pulling conductors, swab out all raceways to remove any debris that may have entered raceways during construction or during storage.
  - 3. When external surfaces of raceways or enclosures are rusted, clean and restore surfaces to original condition.
- C. Equipment:
  - 1. After completion of work but prior to turning equipment over to the Owner, clean the exterior surfaces to be free from concrete residue, dirt, paint residue, etc.
  - 2. All dirt, drywall dust, and all other foreign matter shall be blown from, wiped away, or vacuumed from transformer coils, terminal devices, panelboard interiors, switchboard interiors, junction boxes, pullboxes, and other similar equipment enclosures.
  - 3. Thoroughly clean equipment of all stains, paint spots, dirt, and dust. Remove all temporary labels not used for instruction or operation and remove all visible trade labels.

### **3.8 CEILING ACCESS AND OTHER ACCESS PANELS**

- A. Access panels are generally not shown on Drawings but are required to be provided and installed by the Contractor.
- B. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12" X 12" for hand access or 24" X 24" for body access. Minimum 16 gauge frame, not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.
- C. Furnish and install access panels so that electrical transformers, boxes, devices, fixtures, valves, etc. that have electrical connections, and/or require maintenance, operation, or adjustment are made accessible. Include access panels for such equipment in otherwise inaccessible locations, including those concealed in floor, wall, and furred spaces or above ceiling. Access panels shall be by Milcor, Knapp, Nystorm or Inland Steel; coordinate selection with other Sections supplying similar access panels. Color of panel shall be selected by the Architect.
- D. Panels shall include concealed hinges, cam type locking devices, and shall have a frame border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, for field painting for general applications and stainless steel for use in toilet rooms, shower rooms, and similar wet locations.
- E. Access panels shall have same fire rating classification as surface penetrated. Rated access panels must have U.L. Label.

### **3.9 TESTS AND SETTINGS**

- A. Test (or engage and manage an independent testing or commissioning contractor, where specified) all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.

- B. Complete all work as detailed in applicable project Specifications, "Commissioning of Electrical Systems" and "Acceptance Testing and Calibration", or equivalent.
  - C. Make the following minimum field tests and checks (or engage and manage an independent testing or commissioning contractor, where specified). Where possible, make tests and checks prior to energizing electrical equipment. Tests shall be in accordance with manufacturer's requirements and suggestions, industry standards, and with the requirements outlined in the specific Sections of these Specifications. General Testing shall include NETA (National Electrical Testing Association) required and recommended testing of the following systems and equipment:
    - 1. Mechanical inspection, testing and setting of all circuit breakers, disconnect switches, motor starters, control equipment, etc., for proper operation.
  - D. Grounding system.
  - E. Switchgear and switchboards.
  - F. Motor control centers.
  - G. Transformers.
  - H. Wires and cables.
  - I. Substations and protective relaying.
  - J. Variable frequency drives/controllers.
  - K. Wire and cable terminations. Verify that connections meet the equipment's torque requirements. Verify control wire continuity via bell/buzzer test. Megger all power wire and cable. Record all results.
  - L. Set all transformer taps as required in order to obtain the proper secondary voltage.
  - M. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
  - N. Check the ampere rating and setting of all motor circuit protectors, circuit breakers, fuses, thermal overloads for motors, etc., and submit a typed record to the Engineer of same, as well as locations and designations, listing the nameplate service factor, horsepower, and full load current. If inconsistencies are found, new thermal elements shall be supplied and installed by this Contractor.
  - O. Check rotation of all motors, obtain permission from the Owner to start the motors, and proceed to check it for proper rotation. If it rotates in the wrong direction, correct the rotation at the motor. Take all necessary precautions not to damage any equipment.
  - P. Carefully check interlocking, control and instrument wiring for each system, and/or part of a system to ascertain that the system will function properly and as indicated by schematic and wiring diagrams where applicable.
  - Q. Confirm that all panels, switchboards and similar load centers have had loads "equally" balanced among the electrical phases, such that no individual phase load varies from the other phases by more than 15%. Make circuit revisions to achieve this balance, if necessary. Record any and all modifications.
  - R. Provide all instruments, personnel and equipment required for the tests specified herein.
  - S. Check and confirm that all equipment short circuit interrupting and withstand ratings are adequate for the calculated available system fault levels at the point of equipment connection to the electrical system.
  - T. Confirm that short circuit, arc-flash, remote disconnect location, danger, warning, identification and other signs and labels have been provided and installed, per Code, where applicable.
-

- U. All testing shall be scoped, planned, scheduled and coordinated by the Contractor. Notify the Owner at least two (2) weeks in advance of conducting tests. The Contractor shall have qualified personnel present during all testing.
- V. The following additional tests and checks shall be made prior to the energizing of medium- or high-voltage electrical equipment. Contractor shall engage the services of an independent testing firm. Tests shall be conducted by the independent testing firm, and a certified test report shall be submitted stating that the equipment meets and operates in accordance with the manufacturers and job specifications, and that equipment and installation conforms to all applicable standards and specifications:
  - 1. Setting and testing of protective relays and circuit breaker adjustable trip characteristics for calibration and proper operation.
  - 2. Over potential, high potential, insulation resistance, and shield continuity tests for medium voltage cables.
  - 3. Verification of proper installation of all medium voltage cable terminations and splices. Include terminations employing stress cones, pot-heads, heat shrink, lead terminations, manual methods, etc.
  - 4. Mechanical inspection of switches and circuit breakers to assure proper operation.
- W. Three (3) copies of certified test reports shall be furnished to the Engineer for all tests.
- X. Contractor and/or his independent testing contractor (where applicable) shall be responsible for the following:
  - 1. Supply of all electrical equipment, components, systems, and qualified manpower, as applicable, to provide for and execute complete electrical testing, system testing, and acceptance testing and calibration as specified in the Contract Documents and/or as required.
  - 2. Commissioning of electrical systems unless noted otherwise.
  - 3. Testing submittal preparation, testing plan, scheduling, start-up procedures, functional testing, attendance at meetings, testing results recording and documentation.
  - 4. Demonstration and training.
  - 5. Operations and maintenance manuals.
  - 6. Project close out data (bonds, warranties, spare parts, record documents and maintenance service agreements).
- Y. Set all relays, protective devices, breakers, etc., in accordance with findings and recommendations of the Electrical Protective Device Coordination Study and of the equipment manufacturer.
- Z. Infra-red hot spot inspection shall be made of all switchgear, switches, power, and control panels. This shall be done under representative load conditions before the equipment is used by the Owner and again three (3) months before expiration of the one (1) year warranty period.
- AA. Furnish and install Arc-Flash Warning Signs in accordance with NEC and NESC and Project Documents.

**END OF SECTION**



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**SECTION 26 05 19**

**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.
- I. Firestop sleeves.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 260510 - Common Work Results for Electrical.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.3 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

- J. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.
- K. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.
- L. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- M. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- Q. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- U. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- V. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Shop Drawings: Where aluminum conductors have been substituted for copper conductors, submit dimensioned drawings indicating the following:
  - 1. The route and length of substituted circuits.
  - 2. Voltage drop calculations for each substituted circuit, including the circuit load(s) used in the calculations.
  - 3. The size of each conductor, conductor grouping/arrangement, and conduit quantities and sizes.
- D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- E. Field Quality Control Test Reports.

- F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

## 1.8 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

## PART 2 PRODUCTS

### 2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      - 1) Maximum Length: 6 feet.
    - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
      - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet or junction box to panelboard.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Where not approved for use by the authority having jurisdiction.
    - b. Where exposed to damage.
    - c. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

### 2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
  - B. Provide products listed, classified, and labeled as suitable for the purpose intended.
-

- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- H. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- J. Conductor Material:
  - 1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
    - a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, as indicated on plans. Where not indicated on plans or otherwise prohibited, aluminum conductors may be used as follows:
      - 1) Services: Copper conductors size 1/0 AWG and larger.
      - 2) Feeders: Copper conductors size 1/0 AWG and larger.
    - b. Where aluminum conductors are substituted for copper, comply with the following:
      - 1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
      - 2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
  - 4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.
- K. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
- L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- M. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:

- 1) Phase A: Black.
- 2) Phase B: Red.
- 3) Phase C: Blue.
- 4) Neutral/Grounded: White.
- c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:
  - 1) Phase A: Black.
  - 2) Phase B (High-Leg): Orange.
  - 3) Phase C: Blue.
  - 4) Neutral/Grounded: White.
- d. 240/120 V, 1 Phase, 3 Wire System:
  - 1) Phase A: Black.
  - 2) Phase B: Red.
  - 3) Neutral/Grounded: White.
- e. Equipment Ground, All Systems: Green.
- f. Isolated Ground, All Systems: Green with yellow stripe.
- g. Travelers for 3-Way and 4-Way Switching: Pink.

### 2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Installed Underground: Type XHHW-2.
  2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

### 2.4 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Provide oversized neutral conductors.
- F. Provide dedicated neutral conductor for each phase conductor.
- G. Grounding: Full-size integral equipment grounding conductor.
- H. Armor: Steel, interlocked tape.
- I. Provide PVC jacket applied over cable armor.

### 2.5 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

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- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
  - C. Wiring Connectors for Splices and Taps:
    - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
    - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
    - 3. Connectors for Aluminum Conductors: Use compression connectors.
  - D. Wiring Connectors for Terminations:
    - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
    - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
    - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
    - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
    - 5. Aluminum Conductors: Use compression connectors for all connections.
    - 6. Conductors for Control Circuits: Use crimped terminals for all connections.
  - E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
  - F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
  - G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
  - H. Mechanical Connectors: Provide bolted type or set-screw type.
  - I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
  - J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## 2.6 ACCESSORIES

- A. Electrical Tape:
  - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
  - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
  - 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
  - 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
  - 5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

- D. Wire Pulling Lubricant:
  - 1. Listed and labeled as complying with UL 267.
  - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  - 3. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### **3.3 INSTALLATION**

- A. Circuiting Requirements:
    - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
    - 2. When circuit destination is indicated without specific routing, determine exact routing required.
    - 3. Arrange circuiting to minimize splices.
    - 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
    - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
    - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
    - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
      - a. Branch circuits shall have dedicated neutral conductors. Sharing of neutral/grounded conductors among multiple single-phase branch circuits is not permitted.
      - b. Up to three single-phase branch circuits rated not more than 30 amperes, of of different phases, may be installed in a single conduit, but conductor ampacities must be derated in accordance with the NEC and other applicable codes.
      - c. Size raceways, boxes, etc. to accommodate conductors.
    - 8. Provide oversized neutral/grounded conductors where indicated and as specified below.
      - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
  - B. Install products in accordance with manufacturer's instructions.
  - C. Perform work in accordance with NECA 1 (general workmanship).
  - D. Install aluminum conductors in accordance with NECA 104.
  - E. Install metal-clad cable (Type MC) in accordance with NECA 120.
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- F. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Exposed Cable Installation (only where specifically permitted):
  - 1. Route cables parallel or perpendicular to building structural members and surfaces.
  - 2. Protect cables from physical damage.
- H. Installation in Cable Tray: Also comply with Section 26 05 36.
- I. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- J. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
  - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- K. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- L. Install conductors with a minimum of 12 inches of slack at each outlet.
- M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- O. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
  - 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
  - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

- a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  3. Wet Locations: Use heat shrink tubing.
- Q. Insulate ends of spare conductors using vinyl insulating electrical tape.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### **3.4 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is only required for conductors larger than #4 AWG. The resistance test for parallel conductors listed as optional is required.
  1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

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## SECTION 26 05 23

### CONTROL-VOLTAGE ELECTRICAL POWER CABLES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes the following, for use in building-related control systems. Materials used for process control, data communications, and audio/visual systems, can be found in their respective sections in Divisions 27, 28, and 40.
  - 1. Backboards.
  - 2. Category 5e twisted pair cable.
  - 3. Balanced twisted pair cable hardware.
  - 4. Twin-axial data highway cable.
  - 5. RS-485 cable.
  - 6. Control cable.
  - 7. Control-circuit conductors.
- B. Related Requirements:
  - 1. Section 260510 "Common Work Results for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

##### 1.2 ACTION SUBMITTALS

- A. Product Data:
  - 1. Backboards.
  - 2. Category 5e balanced twisted pair cable.
  - 3. Balanced twisted pair cable hardware.
  - 4. RS-485 cable.
  - 5. Control cable.
  - 6. Control-circuit conductors.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

##### 1.4 REFERENCE STANDARDS

- A. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.
- B. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition; 2020.
- C. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.
- D. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

- H. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- I. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- J. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.
- K. UL 1685 - Standard for Safety Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables; Current Edition, Including All Revisions.

## **PART 2 PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
  - 1. Flame Travel Distance: 60 inch or less.
  - 2. Peak Optical Smoke Density: 0.5 or less.
  - 3. Average Optical Smoke Density: 0.15 or less.
- C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

### **2.2 BACKBOARDS**

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inch.
- B. Painting: Paint plywood on all sides and edges with flat gray paint. Comply with requirements in Section 099123 "Interior Painting."

### **2.3 CATEGORY 5E BALANCED TWISTED PAIR CABLE**

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.
- B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.
- C. Conductors: 100 ohm, No. 24 AWG solid copper.
  - 1. Lead Content: Less than 300 parts per million.
- D. Shielding/Screening: Unshielded twisted pairs (UTP).
- E. Cable Rating: Plenum.
- F. Jacket: White thermoplastic, unless otherwise indicated.

### **2.4 BALANCED TWISTED PAIR CABLE HARDWARE**

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- B. General Requirements for Balanced Twisted Pair Cable Hardware:
  - 1. Comply with the performance requirements of Category 5e.
  - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
  - 3. Cables must be terminated with connecting hardware of same category or higher.

- C. Connecting Blocks: 110-style IDC for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- D. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
  - 1. Features:
    - a. Universal T568A and T568B wiring labels.
    - b. Labeling areas adjacent to conductors.
    - c. 24 or 48 ports.
  - 2. Construction: 16-gauge steel and mountable on 19 inch equipment racks.
  - 3. Number of Jacks per Field: One for each four-pair.
- E. Patch Cords: Factory-made, four-pair cables in 36 inch lengths; terminated with an eight-position modular plug at each end.
  - 1. Patch cords must have color-coded boots for circuit identification.
- F. Plugs and Plug Assemblies:
  - 1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
  - 2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
- G. Jacks and Jack Assemblies:
  - 1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
  - 2. Designed to snap-in to a patch panel or faceplate.
  - 3. Standards:
    - a. Category 5e, unshielded balanced twisted pair cable must comply with IEC 60603-7-2.
- H. Legend:
  - 1. Machine printed, in the field, using adhesive-tape label.
  - 2. Snap-in, clear-label covers and machine-printed paper inserts.

## 2.5 RS-485 CABLE

- A. Plenum-Rated Cable: NFPA 70, Type CMP.
  - 1. Paired, one pair, No. 22 AWG, stranded (7x30) tinned-copper conductors.
  - 2. Fluorinated ethylene propylene insulation.
  - 3. Unshielded.
  - 4. Fluorinated ethylene propylene jacket.
  - 5. Flame Resistance: NFPA 262.

## 2.6 CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
  - 1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with NFPA 262.

## 2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

## 2.8 SOURCE QUALITY CONTROL

- A. Factory test twisted pair cables according to TIA-568-C.2.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceway selection and installation requirements for conduits as supplemented or modified in this Section.
- B. Comply with requirements in Section 260533.23 "Surface Raceways for Electrical Systems" for raceway selection and installation requirements for wireways as supplemented or modified in this Section.
- C. Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.
- D. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- E. Install manufactured conduit sweeps and long-radius elbows if possible.
- F. Raceway Installation in Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard if entering the room from overhead.
  - 4. Extend conduits 3 inch above finished floor.
  - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96 inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

### 3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568-C Series of standards.
  - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
  - 3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  - 4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
  - 5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
  - 6. Secure and support cables at intervals not exceeding 48 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.

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8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
  9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
  10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
  11. Support: Do not allow cables to lie on removable ceiling tiles.
  12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
  13. Provide strain relief.
  14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
  15. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.
- C. Balanced Twisted Pair Cable Installation:
1. Comply with TIA-568-C.2.
  2. Install termination hardware as specified in Section 271513 "Communications Copper Horizontal Cabling" unless otherwise indicated.
  3. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways.
  2. Use insulated spade lugs for wire and cable connection to screw terminals.
- E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend copper cable not in a wireway or pathway a minimum of 12 inch above ceilings by cable supports not more than 36 inch apart.
  3. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- F. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment must be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inch.
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inch.
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inch.
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment must be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inch.
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inch.
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inch.
  4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures must be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inch.
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inch.
  5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inch.
-



6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inch.

### **3.3 REMOVAL OF CONDUCTORS AND CABLES**

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

### **3.4 CONTROL-CIRCUIT CONDUCTORS**

- A. Minimum Conductor Sizes:
  1. Class 1 remote-control and signal circuits; No 14 AWG.
  2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

### **3.5 FIRESTOPPING**

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

### **3.6 GROUNDING**

- A. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

### **3.7 IDENTIFICATION**

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers must use label stocks, laminating adhesives, and inks complying with UL 969.
- C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

### **3.8 FIELD QUALITY CONTROL**

- A. Tests and Inspections:
    1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
    2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
    3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
      - a. Test instruments must meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
  - C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
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D. Prepare test and inspection reports.

**END OF SECTION**

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## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

##### 1.2 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

##### 1.3 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

#### PART 2 PRODUCTS

##### 2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 2 Ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  - 3. Metal In-Ground Support Structure:
    - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
  - 4. Concrete-Encased Electrode:
    - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
  - 5. Ground Rod Electrode(s):
    - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
    - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
  - 6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- G. Service-Supplied System Grounding:
  - 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
    - a. Transformers (except autotransformers such as buck-boost transformers).
    - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
    - c. Generators, when neutral is switched in the transfer switch.
  2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
  3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
  4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
  5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
  6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- I. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    - b. Metal gas piping.
    - c. Metal process piping.
  8. Provide bonding for metal building frame.
  9. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
- J. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
-

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
  - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
  - b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
  - c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
  - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

## 2.2 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
  1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
  1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: 12 inches by 3 inches by 1/4 inch thick unless otherwise indicated or required.
  3. Holes for Connections: As indicated or as required for connections to be made.
- E. Ground Rod Electrodes:
  1. Comply with NEMA GR 1.
  2. Material: Copper-bonded (copper-clad) steel.
  3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
  1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
  2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 05 53.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**END OF SECTION**



## SECTION 26 05 29

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

##### 1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

##### 1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
  - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

## **PART 2 PRODUCTS**

### **2.1 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. NFPA 70.
    - b. Applicable building code.
    - c. Requirements of authorities having jurisdiction.
  - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
  - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
  - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of 2.0. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
  - 7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
  - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  - 2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
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- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
  - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 03 30 00.
  - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners in accordance with manufacturer's recommended torque settings.
- I. Remove temporary supports.

**END OF SECTION**

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## SECTION 26 05 33.13

### CONDUIT FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Galvanized steel electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.

##### 1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 07 84 00 - Firestopping.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 33.16 - Boxes for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

##### 1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- L. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

- O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- P. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

### PART 2 PRODUCTS

#### 2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Under Slab on Grade: Use rigid PVC conduit.
  - 2. Exterior, Direct-Buried: Use rigid PVC conduit.
  - 3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
  - 4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from underground.
  - 5. Where rigid polyvinyl (PVC) conduit larger than 1-1/2" trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows for bends.
  - 6. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.
- D. Embedded Within Concrete:
  - 1. Within Slab on Grade: Not permitted.
  - 2. Within Slab Above Ground: Not permitted.

- 
3. Within Concrete Walls Above Ground: Use galvanized steel electrical metallic tubing (EMT) or rigid PVC conduit.
  4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.
  - E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).
  - F. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).
  - G. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).
  - H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).
  - I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT).
  - J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC).
    1. Locations subject to physical damage include, but are not limited to:
      - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      - b. Where exposed below 20 feet in warehouse areas.
  - K. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).
    1. Locations subject to severe physical damage include, but are not limited to:
      - a. High traffic industrial and warehouse areas where exposed below 8 feet, except within electrical and communication rooms or closets.
      - b. Where exposed below 20 feet in industrial manufacturing areas.
  - L. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel electrical metallic tubing (EMT).
  - M. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).
    1. Exterior locations subject to severe physical damage include, but are not limited to:
      - a. Where exposed to vehicular traffic below 20 feet.
  - N. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel electrical metallic tubing (EMT).
  - O. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
    1. Maximum Length: 6 feet.
  - P. Flexible Connections to Vibrating Equipment:
    1. Dry Locations: Use flexible metal conduit (FMC).
    2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
    3. Maximum Length: 6 feet unless otherwise indicated.
    4. Vibrating equipment includes, but is not limited to:
      - a. Transformers.
      - b. Motors.
  - Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC).

## 2.2 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.

- D. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 1/2-inch trade size.
  - 2. Branch Circuit Homeruns: 3/4-inch trade size.
  - 3. Control Circuits: 1/2-inch trade size.
  - 4. Flexible Connections to Luminaires: 3/8-inch trade size.
  - 5. Underground, Interior: 3/4-inch trade size.
  - 6. Underground, Exterior: 1-inch trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### **2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

### **2.4 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

### **2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

### **2.6 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.
  - 4. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.



## 2.7 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## 2.8 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.
- E. Sealing Systems for Concrete Penetrations:
  - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
  - 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- G. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
- I. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
  - B. Install conduit in accordance with NECA 1.
  - C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
  - D. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
  - E. Conduit Routing:
    - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
-

2. When conduit destination is indicated without specific routing, determine exact routing required.
  3. Conceal conduits unless specifically indicated to be exposed.
  4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  5. Unless otherwise approved, do not route exposed conduits:
    - a. Across floors.
    - b. Across top of parapet walls.
    - c. Across building exterior surfaces.
  6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
  7. Arrange conduit to maintain adequate headroom, clearances, and access.
  8. Arrange conduit to provide no more than equivalent of three 90-degree bends between pull points.
  9. Arrange conduit to provide no more than 150 feet between pull points.
  10. Route conduits above water and drain piping where possible.
  11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
  13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.
    - c. Flues.
  14. Group parallel conduits in same area on common rack.
- F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  4. Use conduit strap to support single surface-mounted conduit.
    - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
  7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
  8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
  9. Use of spring steel conduit clips for support of conduits is not permitted.
  10. Use of wire for support of conduits is not permitted.
- G. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

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5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
  7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
  8. Secure joints and connections to provide mechanical strength and electrical continuity.
- H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
  8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.
- I. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
    - a. Underground, Exterior: 36 inches.
    - b. Under Slab on Grade: 12 inches to bottom of slab.
  2. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 05 53.
- J. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 30 00.
- K. Where 4 or more conduits, grouped together, emerge from underground to penetrate slab on grade, provide a minimum of 3 inch high housekeeping pad, with minimum concrete cover of 3 inches on all sides, unless otherwise indicate; see Section 0333000.
- L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  3. Where conduits are subject to earth movement by settlement or frost.
- M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    - a. Where conduits enter building from outside.
    - b. Where service conduits enter building from underground distribution system.
    - c. Where conduits enter building from underground.
    - d. Where conduits may transport moisture to contact live parts.
  2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
-

- a. Where conduits pass from outdoors into conditioned interior spaces.
- b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide grounding and bonding; see Section 26 05 26.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

### **3.4 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

### **3.5 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

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**SECTION 26 05 33.16**

**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.
- E. Underground boxes/enclosures.

**1.2 RELATED REQUIREMENTS**

- A. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Poke-through assemblies.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, floor boxes, and underground boxes/enclosures.
1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Keys for Lockable Enclosures: Two of each different key.

#### 1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
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- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use cast iron boxes where exposed galvanized steel rigid metal conduit is used.
  4. Use suitable concrete type boxes where flush-mounted in concrete.
  5. Use suitable masonry type boxes where flush-mounted in masonry walls.
  6. Use raised covers suitable for the type of wall construction and device configuration where required.
  7. Use shallow boxes where required by the type of wall construction.
  8. Do not use "through-wall" boxes designed for access from both sides of wall.
  9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  13. Wall Plates: Comply with Section 26 27 26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
  2. Use cast iron floor boxes within slab on grade.
  3. Use sheet-steel or cast iron floor boxes within slab above grade.
  4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
- F. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
  4. Applications:
    - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
    - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
    - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.



5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
  - a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Locations:
  1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  2. Unless dimensioned, box locations indicated are approximate.
  3. Locate boxes as required for devices installed under other sections or by others.
  4. Locate boxes so that wall plates do not span different building finishes.
  5. Locate boxes so that wall plates do not cross masonry joints.
  6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
  9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
  10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
- E. Box Supports:
  1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- F. Install boxes plumb and level.
- G. Flush-Mounted Boxes:
  1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4

- inch or does not project beyond finished surface.
- 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
- 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- H. Install boxes as required to preserve insulation integrity.
- I. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- J. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches deep.
  - 2. Flush-mount enclosures located in concrete or paved areas.
  - 3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
  - 4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- K. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- M. Close unused box openings.
- N. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- O. Provide grounding and bonding in accordance with Section 26 05 26.
- P. Identify boxes in accordance with Section 26 05 53.

### **3.3 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### **3.4 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

### **END OF SECTION**

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## SECTION 26 05 36

### CABLE TRAYS FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Metal cable tray systems:
  - 1. Metal ladder cable tray.

##### 1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

##### 1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NEMA BI-50016 - Cable Tray Installation Guidelines; 2024.
- D. NEMA VE 1 - Metal Cable Tray Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts. Coordinate work to avoid installation of obstructions within cable tray required clearances.
  - 2. Coordinate arrangement of cable tray with dimensions and clearance requirements of actual products to be installed.
  - 3. Coordinate work with placement of supports and anchors required for mounting.
  - 4. Notify of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meeting: Convene one week prior to commencing work of this section; require attendance of affected installers. Review proposed routing, sequence of installation, and protection requirements for installed cable tray.
- C. Sequencing:
  - 1. Do not begin installation of cables until installation of associated cable tray run is complete.

##### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable tray system components and accessories. Include dimensions, materials, fabrication details, finishes, and span/load ratings.
- C. Shop Drawings: Include dimensioned plan views and sections indicating proposed cable tray routing, required clearances, and locations and details of supports, fittings, building element penetrations, and equipment connections.

## 1.6 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- C. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratories (NRTL), and acceptable to authorities having jurisdiction.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA BI-50016, except do not store cable tray outdoors without cover as permitted in NEMA BI-50016.
- B. Handle products carefully to avoid damage to finish.

## PART 2 PRODUCTS

### 2.1 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

- A. Provide new cable tray system consisting of required components, fittings, supports, and accessories, as necessary for complete system.
- B. Provide products listed, classified, and labeled as suitable for purpose intended.
- C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.
- D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under service conditions at installed location.
- E. Unless otherwise indicated, specified span/load ratings are based on safety factor of 1.5 and working load only (i.e., no additional concentrated static load), with ratings for metal cable tray systems in accordance with NEMA VE 1.
- F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values, with values for metal cable tray systems in accordance with NEMA VE 1 including applicable allowable tolerances.

### 2.2 METAL CABLE TRAY SYSTEMS

- A. Comply with NEMA VE 1.
- B. Material/Finishes:
  - 1. Mill-Galvanized Before Fabrication (Pre-Galvanized) Steel: Comply with ASTM A653/A653M, G90 coating.
- C. Metal Ladder Cable Tray:
  - 1. Material: Mill-galvanized before fabrication (pre-galvanized) steel.
  - 2. Load/Fill Depth: As indicated on drawings.
  - 3. Span/Load Rating: NEMA VE 1 Class 8A.

4. Rung Spacing: 9 inches on center for straight lengths.
5. Inside Width: As indicated on drawings.
6. Inside Radius of Fittings: 12 inches.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that work likely to damage cable tray system has been completed.
- B. Verify field measurements.
- C. Verify dimensions and span/load ratings of cable tray system components.
- D. Verify that mounting surfaces are ready to receive cable tray and associated supports.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
  - B. Install cable tray in accordance with NECA 1 (general workmanship) and NEMA BI-50016.
  - C. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.
  - D. Arrange cable tray to provide required clearances and maintain cable access.
    1. Minimum Clearance Above and Adjacent to Cable Tray: 12 inches.
  - E. Install cable tray plumb and level, with sections aligned and with horizontal runs at specified elevation.
  - F. Cable Tray Movement Provisions:
    1. Provide expansion fittings where cable tray is subject to movement, including but not limited to:
      - a. Where cable tray crosses structural joints intended for expansion.
      - b. Long straight cable tray runs in accordance with NEMA BI-50016.
    2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA BI-50016.
    3. Set gaps for expansion fittings in accordance with NEMA BI-50016.
  - G. Cable and Conductors:
    1. Ampacity: As determined by applications listed in NFPA 70.
  - H. Cable Provisions:
    1. Use fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
    2. Use drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.
    3. Use cable support fittings for long vertical cable tray runs with heavy cables.
  - I. Provide end closures at unconnected ends of cable tray runs.
  - J. Cable Tray Support:
    1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA BI-50016 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment where not furnished by cable tray manufacturer.
    2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  - K. Grounding and Bonding Requirements:
    1. Comply with grounding and bonding requirements of NEMA BI-50016.
    2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified cable tray connectors to provide electrical continuity. Do not use classified cable tray connectors where cable tray
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sections have been modified, such as being bent, cut, or reshaped.

3. Provide suitable equipment grounding conductor in each metal cable tray, except where cable tray contains only multiconductor cables with integral equipment grounding conductors. Do not use metal cable tray system as sole equipment grounding conductor.
  - a. Equipment Grounding Conductor for Galvanized Steel Cable Tray: Use bare or insulated copper conductor.
- L. Conduit Termination:
  1. Use listed cable tray conduit clamps (evaluated for bonding connection) to terminate conduits at cable tray.
  2. Provide insulating bushing at conduit termination to protect cables.
  3. Provide independent support for conduit.
- M. Penetrations: Install firestopping to preserve fire resistance rating of building elements.
- N. Identification Requirements:
- O. Install cable tray covers where indicated and as follows:

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Inspect cable tray system for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective cable tray system components.

### **3.4 ADJUSTING**

- A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

### **3.5 CLEANING**

- A. Remove dirt and debris from cable tray.
- B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.6 PROTECTION**

- A. Protect cable tray system from subsequent construction operations.

**END OF SECTION**

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## SECTION 26 05 44

### SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Round sleeves.
  - 2. Rectangular sleeves.
  - 3. Sleeve-seal systems.
  - 4. Grout.
- B. Related Requirements:
  - 1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
  - 2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
  - 3. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

##### 1.3 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- B. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

#### PART 2 PRODUCTS

##### 2.1 ROUND SLEEVES

- A. Steel Wall Sleeves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Advance Products & Systems, LLC
    - b. CCI Piping Systems
    - c. Flexicraft Industries
    - d. GPT; a division of EnPRO Industries
    - e. Specified Technologies Inc.
  - 2. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.
- B. Cast-Iron Wall Sleeves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Company
    - b. Flexicraft Industries
    - c. McWane Ductile
  - 2. General Characteristics: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

## 2.2 RECTANGULAR SLEEVES

- A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:
  - 1. Subject to compliance with requirements, provide products by one of the following:
    - a. Abesco Fire LLC
    - b. Specified Technologies Inc.
    - c. Wiremold; Legrand North America, LLC
  - 2. General Characteristics:
    - a. Material: Galvanized sheet steel.
    - b. Minimum Metal Thickness:
      - 1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch, thickness must be 0.052 inch.
      - 2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

## 2.3 SLEEVE-SEAL SYSTEMS

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, LLC
  - 2. American Polywater Corporation
  - 3. BWM Company
  - 4. CALPICO, Inc.
  - 5. Flexicraft Industries
  - 6. GPT; a division of EnPRO Industries
  - 7. Metraflex Company (The)
  - 8. Proco Products, Inc
  - 9. Roxtec Inc.
- B. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.
- C. Options:
  - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
    - a. Where hydrocarbons are present in soil, use Nitrile (Buna N) materials.
  - 2. Pressure Plates: carbon steel or stainless steel.
  - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel if stainless steel pressure plates are used, of length required to secure pressure plates to sealing elements.

## 2.4 GROUT

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Specified Technologies Inc.
  - 2. W. R. Meadows, Inc
- B. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
  - 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
  - 2. Design Mix: 5000 psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS**

- A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:
  - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
    - b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
  - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed or seismic criteria require different clearance.
  - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
  - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 2. Seal space outside of sleeves with approved joint compound for wall assemblies.
- C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- E. Underground, Exterior-Wall and Floor Penetrations:
  - 1. Install cast-iron pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.

### **3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS**

- A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.
- B. Install conduits and cable with no crossings within the sleeve.
- C. Fill opening around conduits and cables with expanding foam without leaving voids.
- D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

### **3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS**

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

## **END OF SECTION**

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## SECTION 26 05 48

### VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL (DELEGATED)

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Vibration controls.
  - 2. Seismic and wind controls.
- B. Related Requirements:
  - 1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on the Project.
  - 2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on the Project.
  - 3. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
  - 4. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports referenced by this Section.

##### 1.2 DEFINITIONS

- A. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
- B. OSHPD: Office of Statewide Health Planning and Development (for the State of California owned and regulated medical facilities).

##### 1.3 DELEGATED DESIGN SERVICES

- A. Delegated Design Professionals: Engage qualified structural professional engineer to design seismic and wind controls.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Prepare and submit catalog cuts, brochures, diagrams, schedules, and performance data illustrating size, physical appearance, and other characteristics of product.
    - a. Include rated load capacity for each seismic- and wind-restraint device.
    - b. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic- and wind-restraint component used.
    - c. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by UL product listing or other agency acceptable to authorities having jurisdiction.
    - d. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Shop Drawings:
  - 1. Detail fabrication and assembly of equipment bases.
  - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
  - 3. Show coordination of seismic and wind bracing for components with other systems and equipment in the vicinity, including other supports and seismic restraints.

C. Delegated Design Submittals:

1. For each seismic-restraint device, including restraint - rigid and cable type, restraint accessory, and concrete anchor and insert that is required by this Section or is indicated on the Drawings, submit the following:
  - a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.
  - b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic criteria. Include certification that device is approved by qualified testing laboratory for seismic reinforcement use.
  - c. Seismic Design Calculations: Submit input data and loading calculations.
2. Seismic- and Wind-Restraint Detail Drawings:
  - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
  - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
3. Product Listing, Preapproval, and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

D. Field quality-control reports.

**1.5 REGULATORY AGENCY APPROVALS**

- A. Delegated design submittals and shop drawings requiring approval by authorities having jurisdiction must be signed by qualified structural professional engineer responsible for their preparation. Submit for action by Architect prior to submitting for approval by authorities having jurisdiction.

**1.6 QUALIFICATIONS**

- A. Structural Professional Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including design of seismic and wind controls, equipment hangers and supports, and concrete foundations.

**1.7 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- B. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Prepare design calculations in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical" and Section 018123 "Facility Seismic and Wind Criteria."
- B. Seismic and Wind Restraint Device Ratings: Devices must be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices must be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: an agency acceptable to authorities having jurisdiction.
- C. Consequential Damage: Provide additional seismic and wind restraints for suspended components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component will not cause failure of any other essential building component.

- D. Fire/Smoke Resistance: Seismic- and wind-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by qualified testing laboratory in accordance with ASTM E84 or UL 723, and be so labeled.
- E. Component Supports:
  - 1. Load ratings, features, and applications of reinforcement components must be based on testing standards of qualified testing laboratory.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and equipment to receive seismic and wind control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 SELECTION OF VIBRATION AND SEISMIC CONTROLS**

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static, wind, and seismic loads within specified loading limits.

#### **3.3 INSTALLATION OF SEISMIC AND WIND CONTROLS**

- A. Provide seismic and wind control devices for systems and equipment where indicated in Equipment Schedules or Seismic and Wind Controls Schedule, where indicated on the Drawings, where the Specifications indicate they must be installed on specific equipment and systems, and where required by applicable codes.
  - 1. Install equipment and devices to withstand the effects of earthquake motions and high wind events.
- B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- C. Installation of seismic and wind restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.
- D. Equipment Restraints:
  - 1. Install seismic-restraint and wind-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Accommodation of Differential Seismic Motion: Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

#### **3.4 FIELD QUALITY CONTROL**

- A. Special Structural Tests and Inspections:
-

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
  2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
  3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
- B. Nonconforming Work:
1. Seismic controls will be considered defective if they do not pass tests and inspections.
  2. Remove and replace malfunctioning units and retest as specified above.
- C. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

**END OF SECTION**

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## SECTION 26 05 53

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Floor marking tape.
- F. Warning signs and labels.

##### 1.2 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting.
- B. Section 09 91 23 - Interior Painting.
- C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

##### 1.3 REFERENCE STANDARDS

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

##### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

##### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

## 1.7 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

## PART 2 PRODUCTS

### 2.1 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify power source and circuit number. Include location when not within sight of equipment.
      - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
      - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
    - b. Transformers:
      - 1) Identify kVA rating.
      - 2) Identify voltage and phase for primary and secondary.
      - 3) Identify power source and circuit number. Include location when not within sight of equipment.
      - 4) Identify load(s) served. Include location when not within sight of equipment.
    - c. Enclosed switches, circuit breakers, and motor controllers:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
      - 3) Identify load(s) served. Include location when not within sight of equipment.
    - d. Busway:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
      - 3) Provide identification at maximum intervals of 40 feet.
      - 4) Use identification nameplate to identify load(s) served for each plug-in unit. Include location when not within sight of equipment.
    - e. Enclosed Contactors:
      - 1) Identify voltage and phase.
      - 2) Identify coil voltage.
    - f. Centralized Emergency Lighting Inverters:
      - 1) Identify input and output voltage and phase.
      - 2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
      - 3) Identify load(s) served. Include location.
    - g. Transfer Switches:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
      - 3) Identify load(s) served. Include location when not within sight of equipment.
      - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
  - 2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.

- b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
    3. Emergency System Equipment:
      - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
      - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
      - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
    4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
    5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
    6. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
    7. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
    8. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
      - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.
    9. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
      - a. Service equipment.
      - b. Industrial control panels.
      - c. Motor control centers.
      - d. Elevator control panels.
      - e. Industrial machinery.
    10. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.
    11. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
  - B. Identification for Conductors and Cables:
    1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
    2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
    3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
      - a. At each source and load connection.
      - b. Within boxes when more than one circuit is present.
      - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
  - C. Identification for Cabinets and Miscellaneous Equipment Enclosures
    1. Use identification labels to identify enclosed equipment, supplying panel and circuit number(where applicable).
  - D. Identification for Boxes:
    1. Use identification labels to identify circuits enclosed.
-

2. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:

1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
2. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

## 2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
  - a. Indoor Clean, Dry Locations: Use plastic nameplates.
  - b. Outdoor Locations: Use plastic or stainless steel nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
  - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
  - a. System designation where applicable:
    - 1) Emergency Power System: Identify with text "EMERGENCY".
    - 2) Fire Alarm System: Identify with text "FIRE ALARM".
  - b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
  - a. System Designation: 1 inch.
  - b. Equipment Designation: 1/2 inch.
5. Color:
  - a. Normal Power System: White text on black background.
  - b. Emergency Power System: White text on Orange background.
  - c. Fire Alarm System: White text on red background.

D. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

## 2.3 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
  - 1. Do not use handwritten text.
- E. Minimum Text Height: 1/8 inch.
- F. Color: Black text on white background unless otherwise indicated.

## 2.4 VOLTAGE MARKERS

- A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- B. Minimum Size:
  - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
- C. Legend:
  - 1. Markers for Voltage Identification: Highest voltage present.
  - 2. Markers for System Identification:
    - a. Emergency Power System: Text "EMERGENCY".
- D. Color: Black text on orange background unless otherwise indicated.

## 2.5 FLOOR MARKING TAPE

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches wide, with alternating black and white stripes.

## 2.6 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
  - 1. Materials:
  - 2. Minimum Size: 7 by 10 inches unless otherwise indicated.
- C. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
-

- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Interior Components: Legible from the point of access.
  - 6. Conduits: Legible from the floor.
  - 7. Boxes: Outside face of cover.
  - 8. Conductors and Cables: Legible from the point of access.
  - 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

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**SECTION 26 05 73**  
**POWER SYSTEM STUDIES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Short-circuit study.
- B. Protective device coordination study.
- C. Arc flash and shock risk assessment.
  - 1. Includes arc flash hazard warning labels.
- D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

**1.3 REFERENCE STANDARDS**

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).
- C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).
- D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.
- F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).
- G. NEMA MG 1 - Motors and Generators; 2021.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
  - 2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Submit study reports prior to or concurrent with product submittals.



2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Study preparer's qualifications.
- C. Study reports, signed and sealed and signed by study preparer.
- D. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.
- E. Certification that field adjustable protective devices have been set in accordance with requirements of studies.
- F. Project Record Documents: Revise studies as required to reflect as-built conditions.
  1. Include hard copies with operation and maintenance data submittals.
  2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

### 1.6 POWER SYSTEM STUDIES

- A. Scope of Studies:
  1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
  2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
- B. General Study Requirements:
  1. Comply with NFPA 70.
  2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.
- C. Data Collection:
  1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
    - a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      - 1) Obtain up-to-date information from Utility Company.
    - b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
    - c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
    - d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
    - e. Protective Devices:
      - 1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
      - 2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
    - f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
    - g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

- D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
  2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
    - a. Maximum utility fault currents.
    - b. Maximum motor contribution.
    - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
  3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.
- E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
  2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
  3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.
- F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
  2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
    - a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.
    - b. For single-phase systems, study preparer to perform calculations assuming three-phase system in accordance with IEEE 1584 using single phase bolted fault current, yielding conservative results.
  3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.
  4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
    - a. Maximum and minimum utility fault currents.
    - b. Maximum and minimum motor contribution.
    - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
- G. Study Reports:
1. General Requirements:
    - a. Identify date of study and study preparer.
    - b. Identify study methodology and software product(s) used.
    - c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
    - d. Identify base used for per unit values.
    - e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
    - f. Include conclusions and recommendations.
  2. Short-Circuit Study:
    - a. For each scenario, identify at each bus location:
      - 1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
      - 2) Fault point X/R ratio.
      - 3) Associated equipment short circuit current ratings.
-

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- b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
  3. Protective Device Coordination Study:
    - a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
    - b. For each graph include (where applicable):
      - 1) Partial single-line diagram identifying the portion of the system illustrated.
      - 2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
      - 3) Conductors: Damage curves.
      - 4) Transformers: Inrush points and damage curves.
      - 5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
      - 6) Motors: Full load current, starting curves, and damage curves.
      - 7) Capacitors: Full load current and damage curves.
    - c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
      - 1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
      - 2) Include ground fault pickup and delay.
      - 3) Include fuse ratings.
      - 4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
    - d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
  4. Arc Flash and Shock Risk Assessment:
    - a. For the worst case for each scenario, identify at each bus location:
      - 1) Calculated incident energy and associated working distance.
      - 2) Calculated arc flash boundary.
      - 3) Bolted fault current.
      - 4) Arcing fault current.
      - 5) Clearing time.
      - 6) Arc gap distance.
    - b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
    - c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

## 1.7 QUALITY ASSURANCE

- A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
  1. Study preparer may be employed by manufacturer of electrical distribution equipment.
- B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

## PART 2 PRODUCTS

### 2.1 ARC FLASH HAZARD WARNING LABELS

- A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
  1. Materials: Comply with Section 26 05 53.

2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
  - a. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
  - b. Include the following information:
    - 1) Arc flash boundary.
    - 2) Available incident energy and corresponding working distance.
    - 3) Nominal system voltage.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Install arc flash warning labels in accordance with Section 26 05 53.

#### **3.2 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Adjust equipment and protective devices for compliance with studies and recommended settings.
- D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

### **END OF SECTION**

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## SECTION 26 09 45

### NETWORK LIGHTING CONTROLS

#### PART 1 GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 RELATED REQUIREMENTS

- A. System components shall comply with UL 916 and UL 924 as applicable.
- B. System shall be installed in accordance with NFPA 70.

##### 1.3 SUMMARY

- A. Section Includes: Networked lighting control system comprised of system interfaces, system controller, digital time clock, networked control devices, and communication interfaces.

##### 1.4 DEFINITIONS

- A. DDC: Direct digital control.
- B. IP: Internet protocol.
- C. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

##### 1.5 SUBMITTALS

- A. Product Data: For each type of product.
    - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, relays, manual switches and plates, and conductors and cables.
    - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - B. Shop Drawings: For each relay panel and related equipment.
    - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
    - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
    - 3. Detail wiring partition configuration, current, and voltage ratings.
    - 4. Short-circuit current rating of relays.
    - 5. Address Drawing: Reflected ceiling plan and floor plans, showing connected luminaires, address for each luminaire, and luminaire groups. Base plans on construction plans, using the same legend, symbols, and schedules.
    - 6. Point List and Data Bus Load: Summary list of all control devices, sensors, ballasts, and other loads. Include percentage of rated connected load and device addresses.
    - 7. Wire Termination Diagrams and Schedules: Coordinate nomenclature and presentation with Drawings and block diagram. Differentiate between manufacturer-installed and field-installed wiring.
    - 8. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
-

## 1.6 QUALITY ASSURANCE

- A. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems
  - 1. Show interconnecting signal and control wiring, and interface devices that prove compatibility of inputs and outputs.
  - 2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices comply with interoperability requirements of the network protocol.
- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's special warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.
- B. Software and Firmware Operational Documentation:
  - 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On USB drive.
  - 3. Device address list.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lighting Control Relays: Equal to 10 percent of amount installed for each size indicated, but no fewer than 4.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panels for installation according to NECA 407.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of standalone multipreset modular dimming controls that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Damage from transient voltage surges.
  - 2. Warranty Period: Cost to repair or replace any parts for two years from date of Substantial Completion.
  - 3. Extended Warranty Period: Cost of replacement parts (materials only, f.o.b. the nearest shipping point to Project site), for five years, that failed in service due to transient voltage surges.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. General Operation: Input signal from field-mounted manual switches, or digital signal sources, shall open or close one or more lighting control relays in the lighting control panels, or shall operate power packs or fixture-integrated control modules. Any combination of inputs shall be programmable to any number of control relays, power packs, or control modules. Dimming signals (0-10V) from field-mounted dimmer switches, or digital signal sources, shall operate dimmer modules in dimming relay panels, or shall dim fixtures with integral dimming control modules.
- B. Surge Protective Device: Factory installed as an integral part of control components or field-mounted surge suppressors complying with UL 1449, SPD Type 2.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.
- E. Comply with UL 916.

## 2.2 SEQUENCE OF OPERATIONS

- A. Control Zones
  - 1. Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) shall be capable of transmitting and tracking occupancy sensor, photocell sensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within the area. These shall also be referred to as local control zones.
  - 2. Networked luminaires and intelligent lighting control devices shall include the ability to track occupancy broadcasts from adjacent zones. When this feature is enabled, luminaire output for a vacant zone will reduce to a configurable dimmed state if one or more adjacent zones are occupied. Luminaires will turn off when both primary and adjacent zones are vacant.
- B. Wall Stations
  - 1. Wall stations shall be provided to support the following capabilities:
    - a. On/Off of a local control zone.
    - b. Continuous dimming control of light level of a local control zone.
    - c. 3-way / multi-way control: multiple wall stations shall be capable of controlling the same local control zones, so as to support “multi-way” switching and/or dimming control.
- C. Occupancy Sensors
  - 1. Occupancy sensors shall be configurable to control a local zone.
  - 2. Multiple occupancy sensors shall be capable of controlling the same local zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones.
  - 3. System shall support the following types of occupancy sensing sequence of operations:
    - a. On/Off Occupancy Sensing
    - b. Partial-On Occupancy Sensing
    - c. Partial-Off Occupancy Sensing
    - d. Vacancy Sensing (Manual-On / Automatic-Off)
  - 4. On/Off, Partial-On, and Partial-Off Occupancy Sensing modes shall function according to the following sequence of operation:
    - a. Occupancy sensors shall automatically turn lights on to a designated level when occupancy is detected. To support fine tuning of Partial-On sequences the designated occupied light level shall support at least 100 dimming levels.
    - b. Occupancy sensors shall automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. To support fine tuning of Partial-Off sequences the designated unoccupied dim level shall support at least 100 dimming levels.
    - c. To provide additional energy savings the system shall also be capable of combining Partial-Off and Full-Off operation by dimming the lights to a designated level when vacant and then turning the lights off completely after an additional amount of time.
    - d. Photocell readings, if enabled in the Occupancy Sensing control zone, shall be capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary to further reduce energy usage. Additional requirements and details for photocell sensing capabilities are indicated under Photocell Sensing Capabilities.
    - e. The use of a wall station shall change the dimming level or turn lights off as selected by the occupant. The lights shall optionally remain in this manually-specified light level until the zone becomes vacant; upon vacancy the normal sequence of operation, as defined above, shall proceed.



5. Vacancy Sensing mode (also referred to as Manual-On / Automatic-Off) shall function according to the following sequence of operation:
    - a. The use of a wall station is required turn lights on. The system shall be capable of programming the zone to turn on to either to a designated light level or the previous user light level. Initially occupying the space without using a wall station shall not result in lights turning on.
    - b. To provide additional energy savings and an enhanced occupant experience, the system shall also be capable of dimming the lights when vacant and then turning the lights off completely after an additional amount of time.
    - c. To minimize occupant impact in case the area or zone is still physically occupied following dimming or shutoff of the lights due to detection of vacancy, the system shall support an "automatic grace period" immediately following detection of vacancy, during which time any detected occupancy shall result in the lights reverting to the previous level. After the grace period has expired, the use of a wall station is required to turn lights on.
    - d. Photocell readings, if enabled in the Occupancy Sensing control zone, shall be capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary to further reduce energy usage. Additional requirements and details for photocell sensing capabilities are indicated under Photocell Sensing Capabilities.
    - e. At any time, the use of a wall station shall change the dimming level or turn lights off as selected by the occupant. The lights shall optionally remain in this manually-specified light level until the zone becomes vacant; upon vacancy the normal sequence of operation, as defined above, shall proceed.
  6. To accommodate diverse types of environments, occupancy time delays before dimming or shutting off lights shall be specifiable for control zones between 15 seconds to 2 hours.
- D. Photocell Sensors
1. Photocell sensing devices shall be configurable to control a local zone.
  2. The system shall support the following type of photocell-based control:
    - a. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to adjust the photocell setpoint and dimming rates.
- E. Scheduling
1. System shall support the creation of time schedules for time-of-day override of devices including offsets from dusk and dawn.
  2. System shall support blink warning and timed extension capabilities.
    - a. The system shall be capable of providing a visible "blink warning" 5 minutes prior to the end of the schedule.
    - b. Timed override/extension duration shall be programmable for each individual device, zone of devices, or customized group of devices, ranging from 5 minutes to 12 hours.
- F. Global Profiles
1. The system shall be capable of automatically modifying the sequence of operation for selected devices in response to any of the following: a time-of-day schedule, contact closure input state, manually triggered wired wall station input, RS-232/RS-485 command to wired input device, and BACnet input command. This capability is defined as supporting "Global Profiles" and is used to dynamically optimize the occupant experience and lighting energy usage.
  2. Global profiles may be scheduled with the following capabilities:
    - a. Global Profiles shall be stored within and executed from the system controller (via internal timeclock) such that a dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles.
    - b. Global Profile time-of-day schedules shall be capable of being given the following recurrence settings: daily, specific days of week, every "n" number of days, weekly, monthly, and yearly. Lighting control profile schedules shall support definition of start date, end date, end after "n" recurrences, or never ending. Daylight savings time adjustments shall be

- capable of being performed automatically, if desired.
- c. Global Profile Holiday Schedules should follow recurrent settings for specific US holiday dates regardless if they always occur on a specific date or are determined by the day/week of the month.
- d. Global Profiles shall be capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock.
- e. Software management interface shall be capable of displaying a graphic calendar view of profile schedules for each control zone.
- 3. A backup of Local and Global Profiles shall be stored on the software's host server such that the Profile backup can be applied to a replacement system controller or wired wall station.

### 2.3 SYSTEM SOFTWARE INTERFACES

- A. Management Interface
  - 1. System shall provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
  - 2. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®.
  - 3. Management interface shall require all users to login with a User Name and Password, and shall support creation of at least 100 unique user accounts.
  - 4. Management interface shall support at least three permission levels for users: read-only, read & change settings, and full administrative system access.
  - 5. Management interface shall be capable of restricting access for user accounts to specific devices within the system.
  - 6. All system devices shall be capable of being given user-defined names.
    - a. Management interface shall be able to read the live status of a networked luminaire or intelligent control device and shall be capable of displaying luminaire on/off status, dim level, power measurement, device temperature, PIR occupancy sensor status, microphonic occupancy sensor status, remaining occupancy time delay, photocell reading, and active Profiles.
    - b. Management interface shall be able to read the current active settings of a networked luminaire or intelligent control device and shall be capable of displaying dimming trim levels, occupancy sensor and photocell enable/disable, occupancy sensor time delay and light level settings, occupancy sensor response (normal or vacancy), and photocell setpoints and transition time delays.
    - c. Management interface shall be able to change the current active settings and default settings for an individual networked luminaire or intelligent control device.

### 2.4 WIRED NETWORKED CONTROL ZONE CHARACTERISTICS

- A. Connections to devices within a wired networked lighting control zone and to backbone components shall be with a single type of low voltage network cable, which shall be compliant with CAT5e specifications or higher. To prevent wiring errors and provide cost savings, the use of mixed types of low voltage network cables shall not be permitted.
  - 1. Following proper installation and provision of power, all networked devices connected with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g. software application, handheld remote, pushbutton).
  - 2. Once software is installed, system shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
  - 3. All networked devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

### 2.5 WIRED NETWORKED DEVICES

- A. Wired Networked Wall Switches, Dimmers, Scene Controllers

1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
  2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.
  3. Wall switches & dimmers shall support the following device options:
    - a. Number of control zones: 1, 2 or 4
    - b. Control Types Supported: On/Off, On/Off/Dimming
  4. Scene controllers shall support the following device options:
    - a. Number of scenes: 1, 2 or 4
    - b. Control Types Supported: On/Off, On/Off/Dimming, Preset Level Scene
- B. Wired Networked Occupancy and Photosensors
1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
  2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
  3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
  4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
  5. All sensing technologies shall be acoustically passive, meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers and hearing devices). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonic technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
  6. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.
  7. Photosensor and dimming sensor’s set-point and dead band shall be automatically calibrated through the sensor’s microprocessor by initiating an “Automatic Set-point Programming” procedure. Min and max dim settings as well as set-point may be manually entered and/or modified.
  8. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The secondary daylight zone shall be capable of being controlled as an “offset” from the primary zone.
- C. Wired Networked Wall Switch Sensors
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
  2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.
  3. All wall switch sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.
  4. Wall switch sensors shall support the following device options:
    - a. User Input Control Types Supported: On/Off or On/Off/Dimming
    - b. Occupancy Sensing Technology: PIR only or Dual Tech acoustic
    - c. Daylight Sensing Option: Inhibit Photosensor
- D. Wired Networked Power Packs and Secondary Packs
1. Power Packs shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
  2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC) and carry a plenum rating.
-

3. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output, but shall not be required to contribute system power.
4. Power Supplies shall provide system power only, but are not required to switch line voltage circuit.
5. Communication shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors. Secondary packs shall receive low voltage power via standard low voltage network cable.
6. Power Pack programming parameters shall be available and configurable remotely from the software and locally via the device push-button.
7. Power Pack shall securely mount through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast/driver channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
8. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.

## 2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Receive, inspect, handle, and store panels according to NECA 407.
- B. Examine panels before installation. Reject panels that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panels for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
- C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

### 3.3 PANEL INSTALLATION

- A. Comply with NECA 1.
- B. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- C. Mount panel cabinet plumb and rigid without distortion of box.
- D. Install filler plates in unused spaces.

### 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

- B. Create a directory to indicate loads served by each relay; incorporate Owner's final room designations. Obtain approval before installing. Use a PC or typewriter to create directory; handwritten directories are unacceptable.
- C. Lighting Control Panel Nameplates: Label each panel with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### **3.5 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

### **3.6 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

### **3.7 SOFTWARE SERVICE AGREEMENT**

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
  - 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

### **3.8 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the control unit and operator interface.

### **END OF SECTION**

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## SECTION 26 22 00

### LOW-VOLTAGE TRANSFORMERS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. General purpose transformers.
- B. K-factor transformers rated for nonlinear loads.

##### 1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 24 16 - Panelboards.

##### 1.3 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- F. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
  1. K-factor Rated Transformers: Include K-factor ratings.
- C. Field Quality Control Test Reports.

### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

### 1.8 FIELD CONDITIONS

- A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
  1. Greater than 10 kVA: 104 degrees F maximum.
  2. Less than 10 kVA: 77 degrees F maximum.

## PART 2 PRODUCTS

### 2.1 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
  - B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
    1. Altitude: Less than 3,300 feet.
    2. Ambient Temperature:
      - a. Greater than 10 kVA: Not exceeding 104 degrees F.
      - b. Less than 10 kVA: Not exceeding 77 degrees F.
  - C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
  - D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
-



- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

## 2.2 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Insulation System and Allowable Average Winding Temperature Rise:
  - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
  - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- D. Winding Taps:
  - 1. Less than 3 kVA: None.
  - 2. 3 kVA through 15 kVA: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
  - 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
  - 4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- F. Sound Levels: Standard sound levels complying with NEMA ST 20
- G. Mounting Provisions:
  - 1. Less than 15 kVA: Suitable for wall mounting.
  - 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
  - 3. Larger than 75 kVA: Suitable for floor mounting.
- H. Transformer Enclosure: Comply with NEMA ST 20.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor clean, dry locations: Type 2.
    - b. Outdoor locations: Type 3R.
  - 2. Construction: Steel.
    - a. Less than 15 kVA: Totally enclosed, non-ventilated.
    - b. 15 kVA and Larger: Ventilated.
  - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  - 4. Provide lifting eyes or brackets.
- I. Accessories:
  - 1. Mounting Brackets: Provide manufacturer's standard brackets.
  - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.
  - 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

### 2.3 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.
- B. K-factor Rating: K-13, or higher.
- C. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.
- D. Coil Conductors: Continuous aluminum windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.
- E. Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
- F. Neutral Bus: Sized to accommodate twice the rated secondary current.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Sound Levels: Standard sound levels complying with NEMA ST 20
- I. Mounting Provisions:
  - 1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
  - 2. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor clean, dry locations: Type 2.
    - b. Outdoor locations: Type 3R.
  - 2. Construction: Steel, ventilated.
  - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  - 4. Provide lifting eyes or brackets.
- K. Accessories:
  - 1. Mounting Brackets: Provide manufacturer's standard brackets.
  - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.
  - 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).

- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
  - 1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
  - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
  - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
  - 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Identify transformers in accordance with Section 26 05 53.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

### **3.4 ADJUSTING**

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### **3.5 CLEANING**

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

### **END OF SECTION**

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## SECTION 26 24 13

### SWITCHBOARDS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

##### 1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
  - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- G. Section 26 43 00 - Surge Protective Devices.

##### 1.3 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- L. UL 891 - Switchboards; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchboards:
  - 1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
  - 2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
  - 3. Obtain Utility Company approval of switchboard prior to fabrication.
  - 4. Arrange for inspections necessary to obtain Utility Company approval of installation.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  - 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
  - 2. Include wiring diagrams showing all factory and field connections.
  - 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
  - 4. Include documentation demonstrating selective coordination upon request.
  - 5. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Field Quality Control Test Reports.
- H. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.
- I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Enclosure Keys: Two of each different key.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

## 1.8 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Switchboards:
  - 1. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  - 2. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  - 3. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
  - 4. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).
  - 5. Source Limitations: Provide switchboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

### 2.2 SWITCHBOARDS

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Front-Connected Switchboards:
  - 1. Main Device(s): Individually-mounted.
  - 2. Feeder Devices: Panel/group-mounted or individually-mounted.
  - 3. Arrangement: Front accessible only (not rear accessible), rear aligned.
  - 4. Gutter Access: Bolted covers.
- E. Service Entrance Switchboards:
  - 1. Listed and labeled as suitable for use as service equipment according to UL 869A.

2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
  3. Comply with Utility Company requirements for electrical service.
- F. Seismic Qualification: Provide switchboards and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.
- G. Service Conditions:
1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude: Less than 6,600 feet.
    - b. Ambient Temperature:
      - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.
  2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- H. Short Circuit Current Rating:
1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
  2. Listed series ratings are not acceptable.
- I. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- J. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- K. Bussing: Sized in accordance with UL 891 temperature rise requirements.
1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
  2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  3. Phase and Neutral Bus Material: Aluminum.
  4. Ground Bus Material: Aluminum.
- L. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Line Conductor Terminations:
    - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - b. Main and Neutral Lug Type: Mechanical.
  2. Load Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - b. Lug Type:
      - 1) Provide mechanical lugs unless otherwise indicated.
- M. Enclosures:
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
  2. Finish: Manufacturer's standard unless otherwise indicated.
- N. Future Provisions:
1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
-



2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.
  3. Where designated spaces for future device provisions are not indicated, include provisions for minimum of 2 device(s) rated at 10 percent of rating of switchboard main or incoming feed.
- O. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.
- P. Instrument Transformers:
1. Comply with IEEE C57.13.
  2. Select suitable ratio, burden, and accuracy as required for connected devices.
  3. Current Transformers: Connect secondaries to shorting terminal blocks.
  4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

### 2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
1. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  2. Molded Case Circuit Breakers:
    - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
      - 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
      - 2) Provide electronic trip circuit breakers where indicated.
    - b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      - 1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
    - c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      - 1) Provide the following field-adjustable trip response settings:
        - (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
        - (b) Long time delay.
        - (c) Short time pickup and delay.
        - (d) Instantaneous pickup.
        - (e) Ground fault pickup and delay where ground fault protection is indicated.
      - 2) Provide communication capability where indicated: Compatible with system indicated.
    - d. Provide the following circuit breaker types where indicated:
      - 1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
    - e. Provide the following features and accessories where indicated or where required to complete installation:
      - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
      - 2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.
  3. Insulated Case Circuit Breakers:
    - a. Description: Quick-make, quick-break, trip-free circuit breakers with two-step stored energy closing mechanism; standard 80 percent rated unless otherwise indicated; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
    - b. Operation:

- 1) Provide manually operated circuit breakers unless otherwise indicated.
- 2) Provide electrically operated circuit breakers where indicated.
- 3) Pad-Lock Provision: For preventing circuit breaker closing operation.
- c. Construction:
  - 1) Provide fixed-mount circuit breakers unless otherwise indicated.
- d. Trip Units: Solid state, microprocessor-based, true rms sensing.
  - 1) Provide the following field-adjustable trip response settings:
    - (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
    - (b) Long time delay.
    - (c) Short time pickup and delay.
    - (d) Instantaneous pickup.
    - (e) Ground fault pickup and delay where ground fault protection is indicated.
  - 2) Provide communication capability where indicated: Compatible with system indicated.
- e. Provide the following circuit breaker types where indicated:
  - 1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
- f. Provide the following features and accessories where indicated or where required to complete installation:
  - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

## 2.4 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
  1. Dielectric tests.
  2. Mechanical operation tests.
  3. Grounding of instrument transformer cases test.
  4. Electrical operation and control wiring tests, including polarity and sequence tests.
  5. Ground-fault sensing equipment test.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.
- E. Provide required support and attachment in accordance with Section 26 05 29.

- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Install all field-installed devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.
- L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- M. Provide filler plates to cover unused spaces in switchboards.
- N. Identify switchboards in accordance with Section 26 05 53.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- D. Inspect and test in accordance with NETA ATS, except Section 4.
- E. Perform inspections and tests listed in NETA ATS, Section 7.1.
- F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 200 amperes. Tests listed as optional are not required.
- G. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- H. Test shunt trips to verify proper operation.
- I. Correct deficiencies and replace damaged or defective switchboards or associated components.

### **3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

### **3.5 CLEANING**

- A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

### **3.6 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

**3.7 PROTECTION**

A. Protect installed switchboards from subsequent construction operations.

**END OF SECTION**

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## SECTION 26 24 16

### PANELBOARDS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

##### 1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 26 22 00 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.
- G. Section 26 43 00 - Surge Protective Devices.

##### 1.3 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.

- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.
- E. Field Quality Control Test Reports.
- F. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Panelboard Keys: Two of each different key.

#### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

## 1.8 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
- D. Siemens Industry, Inc: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).
- E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

### 2.2 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Listed series ratings are not acceptable.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
  - 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.



- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
    - c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
  - 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- M. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- N. Load centers are not acceptable.
- O. Provide the following features and accessories where indicated or where required to complete installation:
  - 1. Feed-through lugs.
  - 2. Sub-feed lugs.

### **2.3 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
  - B. Conductor Terminations:
    - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - 2. Main and Neutral Lug Type: Mechanical.
  - C. Bussing:
    - 1. Phase and Neutral Bus Material: Tin-plated copper.
    - 2. Ground Bus Material: Tin-plated copper.
  - D. Circuit Breakers:
    - 1. Provide bolt-on type.
    - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
-

3. Provide electronic trip circuit breakers where indicated.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

## 2.4 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum or copper.
3. Ground Bus Material: Aluminum or copper.

- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

## 2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
  - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
    - 2) 14,000 rms symmetrical amperes at 480 VAC.
  - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
  - b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
  - a. Provide the following field-adjustable trip response settings:

- 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
  - 2) Long time delay.
  - 3) Short time pickup and delay.
  - 4) Instantaneous pickup.
  - 5) Ground fault pickup and delay where ground fault protection is indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  7. Provide the following circuit breaker types where indicated:
    - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
    - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
    - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
    - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
  8. Provide listed switching duty rated circuit breakers with SWD marking for lighting circuits and where indicated.
  9. Do not use tandem circuit breakers.
  10. Do not use handle ties in lieu of multi-pole circuit breakers.
  11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
  12. Provide the following features and accessories where indicated or where required to complete installation:
    - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Provide required seismic controls in accordance with Section 26 05 48.
- G. Install panelboards plumb.
- H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

- J. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- K. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- L. Provide grounding and bonding in accordance with Section 26 05 26.
- M. Install all field-installed branch devices, components, and accessories.
- N. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- O. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- P. Set field-adjustable circuit breaker tripping function settings as indicated.
- Q. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- R. Provide filler plates to cover unused spaces in panelboards.
- S. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Emergency and night lighting circuits.
  - 2. Fire detection and alarm circuits.
  - 3. Intrusion detection and access control system circuits.
  - 4. Video surveillance system circuits.

### 3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 200 amperes. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test AFCI circuit breakers to verify proper operation.
- G. Test shunt trips to verify proper operation.
- H. Correct deficiencies and replace damaged or defective panelboards or associated components.

### 3.4 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.5 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

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## SECTION 26 27 26

### WIRING DEVICES

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates and covers.
- D. Floor box service fittings.

##### 1.2 RELATED REQUIREMENTS

- A. Section 26 05 33.16 - Boxes for Electrical Systems.

##### 1.3 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g, with Amendment.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
  1. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.
- C. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.
- D. Project Record Documents: Record actual installed locations of wiring devices.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Extra Wall Plates: One of each style, size, and finish.

### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

## PART 2 PRODUCTS

### 2.1 WIRING DEVICES - GENERAL REQUIREMENTS

- A. Provide wiring devices suitable for intended use with ratings adequate for load served.

### 2.2 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with decorator style rocker type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

### 2.3 RECEPTACLES

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  2. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:
  1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD



- 
- suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- C. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
  4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
- D. Surge Protection Receptacles:
1. Surge Protection Receptacles - General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.
    - a. Energy Dissipation: Not less than 240 J per mode.
    - b. Protected Modes: L-N, L-G, N-G.
    - c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.
    - d. Diagnostics:
      - 1) Visual Notification: Provide indicator light to report functional status of surge protection.
  2. Standard Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
- E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

## 2.4 WALL PLATES AND COVERS

- A. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  2. Size: Standard;\_\_\_\_\_.
  3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- C. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.
- D. Weatherproof Switch Covers for Wet or Damp Locations: Gasketed, metallic, with externally operable actuating means and corrosion-resistant screws; listed as suitable for use in wet locations.

## 2.5 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.
- B. Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:

- a. Cover: Rectangular.
- b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2. Single Service Flush Communications Outlets:
  - a. Cover: Rectangular.
  - b. Configuration: \_\_\_\_\_.
  - c. Voice and Data Jacks: Provided by others.
3. Dual Service Flush Combination Outlets:
  - a. Cover: Rectangular.
  - b. Configuration:
    - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
    - 2) Communications: \_\_\_\_\_.
    - 3) Voice and Data Jacks: Provided by others.
4. Dual Service Flush Furniture Feed:
  - a. Cover: Rectangular.
  - b. Configuration:
    - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
    - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
5. Accessories:
  - a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
  - b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.3 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
  1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

### **3.4 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Inspect each surge protection receptacle to verify surge protection is active.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

### **3.5 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

### **3.6 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **END OF SECTION**

## SECTION 26 28 13

### FUSES

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Fuses.

##### 1.2 RELATED REQUIREMENTS

- A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

##### 1.3 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.
- E. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.
- F. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
    - a. Fusible Enclosed Switches: See Section 26 28 16.16.
  - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

##### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

##### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

#### PART 2 PRODUCTS

##### 2.1 APPLICATIONS

- A. Service Entrance:
    - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
    - 2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
-

- B. Feeders:
  - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
  - 2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- C. General Purpose Branch Circuits: Class RK1, time-delay.
- D. Individual Motor Branch Circuits: Class RK5, time-delay.
- E. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.
- F. Primary Protection for Control Transformers: Class CC, time-delay.

## **2.2 FUSES**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class L Fuses: Comply with UL 248-10.
- I. Class CC Fuses: Comply with UL 248-4.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

### **3.2 INSTALLATION**

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

## **END OF SECTION**

## SECTION 26 28 16.13

### ENCLOSED CIRCUIT BREAKERS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Enclosed circuit breakers.

##### 1.2 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

##### 1.3 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- J. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

##### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
  - 1. Include characteristic trip curves for each type and rating of circuit breaker upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- D. Project Record Documents: Record actual installed locations of enclosed circuit breakers.
- E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

## 1.8 FIELD CONDITIONS

- A. Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

## PART 2 PRODUCTS

### 2.1 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature: Between 23 degrees F and 104 degrees F.
- D. Short Circuit Current Rating:
  - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
  - 2. Listed series ratings are not acceptable.
- E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- F. Conductor Terminations: Suitable for use with the conductors to be installed.
- G. Provide thermal magnetic circuit breakers unless otherwise indicated.
- H. Provide electronic trip circuit breakers where indicated.

- I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- J. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
  - 3. Provide surface-mounted enclosures unless otherwise indicated.
- L. Provide externally operable handle with means for locking in the OFF position.
- M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
  - 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- N. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

## 2.2 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - B. Interrupting Capacity:
    - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      - b. 14,000 rms symmetrical amperes at 480 VAC.
    - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - C. Conductor Terminations:
    - 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
    - 1. Provide the following field-adjustable trip response settings:
      - a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
      - b. Long time delay.
      - c. Short time pickup and delay.
      - d. Instantaneous pickup.
      - e. Ground fault pickup and delay where ground fault protection is indicated.
  - F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  - G. Provide the following features and accessories where indicated or where required to complete installation:
    - 1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
-



### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- I. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.
- J. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- K. Identify enclosed circuit breakers in accordance with Section 26 05 53.

#### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than 200 amperes. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- E. Test shunt trips to verify proper operation.
- F. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

#### **3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.5 CLEANING**

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 28 16.16**  
**ENCLOSED SWITCHES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 28 13 - Fuses.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.5 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings for switches rated 800A or more: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

## PART 2 PRODUCTS

### 2.1 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
  - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.

- b. Outdoor Locations: Type 3R.
- 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:
  - 1. Comply with NEMA KS 1.
  - 2. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Provide compression lugs for switch ratings 800 amperes and above.
    - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- O. Provide the following features and accessories where indicated or where required to complete installation:
  - 1. Hubs: As required for environment type; sized to accept conduits to be installed.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

#### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

**3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.5 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 29 13**  
**ENCLOSED CONTROLLERS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
  - 1. Magnetic motor starters.
  - 2. General purpose contactors.
  - 3. Manual motor starters.
- B. Overcurrent protective devices for motor controllers, including overload relays.
- C. Control accessories:
  - 1. Auxiliary contacts.
  - 2. Pilot devices.
  - 3. Control and timing relays.
  - 4. Control power transformers.
  - 5. Control terminal blocks.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

**1.3 REFERENCE STANDARDS**

- A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- E. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- F. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- J. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

- K. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
  2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
  3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
  4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- D. Field Quality Control Test Reports.
- E. Project Record Documents: Record actual installed locations of controllers and final equipment settings.
1. Include nameplate data of actual installed motors and associated overload relay selections and settings.
  2. Motor Circuit Protectors: Include magnetic instantaneous trip settings.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

#### 1.8 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.



## PART 2 PRODUCTS

### 2.1 ENCLOSED CONTROLLERS

- A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
  - 1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude:
      - 1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
      - 2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
    - b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
  - 2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:
  - 1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
  - 2. Listed series ratings are not acceptable.
- F. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures:
  - 1. Comply with NEMA ICS 6.
  - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
    - b. Outdoor Locations: Type 3R or Type 4.
  - 3. Finish: Manufacturer's standard unless otherwise indicated.
- I. Instrument Transformers:
  - 1. Comply with IEEE C57.13.
  - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
  - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
  - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.
- J. Magnetic Motor Starters: Combination type unless otherwise indicated.
  - 1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
  - 2. Configuration: Full-voltage non-reversing unless otherwise indicated.
  - 3. Disconnects: Circuit breaker type.
    - a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
    - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with

- capability of overriding interlock for testing purposes.
- c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- 4. Overload Relays: Solid-state type unless otherwise indicated.
- 5. Pilot Devices Required:
  - a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
  - b. Single-Speed, Non-Reversing Starters:
    - 1) Pushbuttons: START-STOP.
    - 2) Selector Switches: HAND/OFF/AUTO.
    - 3) Indicating Lights: Red ON, Green OFF.
  - c. Single-Speed, Reversing Starters:
    - 1) Pushbuttons: FOR-REV-STOP.
    - 2) Selector Switches: FOR/OFF/REV.
    - 3) Indicating Lights: Red FOR, Red REV, Green OFF.
- K. General Purpose Contactors: Combination or noncombination type as indicated.
  - 1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
  - 2. Noncombination Contactors: NEMA ICS 2, Class A noncombination motor controllers with magnetic contactor(s), but without integral overload relay(s).
  - 3. Configuration: Full-voltage non-reversing unless otherwise indicated.
  - 4. Disconnects: Circuit breaker type.
    - a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
    - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
    - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- L. Manual Motor Starters:
  - 1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
  - 2. Configuration: Non-reversing unless otherwise indicated.
  - 3. Fractional-Horsepower Manual Motor Starters:
    - a. Furnish with toggle operator.
    - b. Overload Relays: Bimetallic or melting alloy thermal type.

## 2.2 OVERCURRENT PROTECTIVE DEVICES

- A. Overload Relays:
  - 1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
  - 2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
  - 3. Trip-free operation.
  - 4. Visible trip indication.
  - 5. Resettable.
    - a. Employ manual reset unless otherwise indicated.
    - b. Do not employ automatic reset with two-wire control.
  - 6. Bimetallic Thermal Overload Relays:
    - a. Interchangeable current elements/heaters.
    - b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
    - c. Trip test function.
  - 7. Melting Alloy Thermal Overload Relays:
    - a. Interchangeable current elements/heaters.
  - 8. Solid-State Overload Relays:

- a. Adjustable full load current.
  - b. Phase loss protection.
  - c. Phase imbalance protection.
  - d. Ambient temperature insensitive.
  - e. Thermal memory.
  - f. Trip test function.
  - g. Provide isolated alarm contact.
- B. Circuit Breakers:
1. Interrupting Capacity (not applicable to motor circuit protectors):
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  2. Motor Circuit Protectors:
    - a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
    - b. Provide field-adjustable magnetic instantaneous trip setting.

## 2.3 CONTROL ACCESSORIES

- A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
  2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.
- B. Pilot Devices:
1. Comply with NEMA ICS 5; heavy-duty type.
  2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
  3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
  4. Indicating Lights: Push-to-test type unless otherwise indicated.
  5. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
1. Comply with NEMA ICS 5.
  2. Provide number and type of relays indicated or required to perform necessary functions.
- D. Control Power Transformers:
1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus \_\_\_\_\_ VA spare capacity.
  2. Include primary and secondary fuses.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
  - B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.
  - C. Verify that mounting surfaces are ready to receive enclosed controllers.
  - D. Verify that conditions are satisfactory for installation prior to starting work.
-

### **3.2 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install controllers in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed controllers plumb and level.
- F. Provide grounding and bonding in accordance with Section 26 05 26.
- G. Install all field-installed devices, components, and accessories.
- H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.
- J. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.
- K. Identify enclosed controllers in accordance with Section 26 05 53.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.
- D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers larger than 200 amperes. Tests listed as optional are not required.
- E. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

### **3.4 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### **3.5 CLEANING**

- A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

### **3.6 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

**3.7 PROTECTION**

- A. Protect installed enclosed controllers from subsequent construction operations.

**END OF SECTION**

**SECTION 26 33 23**

**CENTRAL BATTERY EQUIPMENT**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Fast-transfer interruptible power supply (IPS) centralized emergency lighting inverters.

**1.2 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
  - 1. Includes requirements for the seismic qualification of equipment specified in this section.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.
- G. Section 26 33 53 - Static Uninterruptible Power Supply: UPS equipment for applications other than emergency lighting.
- H. Section 26 51 00 - Interior Lighting:
  - 1. Luminaires for interface with centralized emergency lighting inverters.
  - 2. Emergency lighting unit equipment.
- I. Section 26 56 00 - Exterior Lighting: Luminaires for interface with centralized emergency lighting inverters.

**1.3 REFERENCE STANDARDS**

- A. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems; 2025.
- G. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- H. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:

1. Coordinate compatibility of centralized emergency lighting inverters to be installed with work provided under other sections or by others.
2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
3. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
  1. Indicate any inverter load restrictions.
  2. Identify mounting conditions required for equipment seismic qualification.
  3. Indicate derated capacities and run-times, as applicable.
- C. Shop Drawings: Indicate dimensions, input/output voltages, power ratings, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, and installed features and accessories.
  1. Include dimensioned plan and elevation views of inverters and adjacent equipment with all required clearances indicated.
  2. Include wiring diagrams showing all factory and field connections.
- D. Derating Calculations: Indicate ratings adjusted for applicable service conditions and/or inverter load restrictions.
- E. Manufacturer's equipment seismic qualification certification.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- G. Provide NFPA 111 required documentation from manufacturer where requested by authorities having jurisdiction.
- H. Field quality control test reports.
- I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- J. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

## 1.6 QUALITY ASSURANCE

- A. Comply with the following:
  1. NFPA 70 (National Electrical Code).
  2. NFPA 111; meet requirements for Level 1 system.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to inverter system components, enclosure, and finish.
- D. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

#### **1.8 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.9 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Inverter Assemblies: Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.
- C. Batteries: Provide pro-rata warranty for the duration of rated design life.

### **PART 2 PRODUCTS**

#### **2.1 CENTRALIZED EMERGENCY LIGHTING INVERTERS - GENERAL REQUIREMENTS**

- A. Provide complete centralized emergency lighting inverter system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
  - 1. Inverter systems for storm shelters shall be suitable for supply of multiple load types, simultaneously. Refer to drawings for specific loads to be connected. Inverter output capacities and run-times shall be derated as necessary to start and run indicated connected loads.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Inverter Assemblies: Manufactured units consisting of inverters, batteries, enclosures, and associated components specifically designed for emergency lighting applications; microprocessor-based utilizing pulse width modulation (PWM) with insulated gate bipolar transistors (IGBT's); listed and labeled as complying with UL 924.
  - 1. Battery Run Times of 90 Minutes: Listed as complying with UL 924 for "emergency lighting and power equipment".
  - 2. Battery Run Times Other than 90 Minutes: Listed as complying with UL 924 for "auxiliary lighting and power equipment".
- D. Provide inverters and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Increase indicated power ratings as required to accommodate any applicable inverter load restrictions.
- F. Inverters Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
- G. Battery System:



1. Provide battery capacity as required for achieving battery run time indicated.
  2. Battery Charger: Microprocessor-controlled, temperature compensated; capable of returning supplied battery(s) from fully discharged to fully charged condition within time required by NFPA 111 and UL 924 unless otherwise indicated.
  3. Provide automatic low voltage battery disconnect to prevent battery "deep discharge" damage.
- H. Seismic Qualification: Provide emergency lighting inverters and associated components suitable for application under the seismic design criteria specified in Section 26 05 48 where required. Include certification of compliance with submittals.
- I. Enclosures:
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  2. Hinged Doors: Lockable, with all locks keyed alike.
  3. Finish: Manufacturer's standard unless otherwise indicated.
- J. Short Circuit Current Rating: Provide inverter assemblies with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
- K. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category B.
- L. Automatic Sequence of Operations:
1. Upon failure or degradation of primary/normal input power, transfer load to battery power.
  2. When primary/normal input power has been restored, retransfer load to primary/normal power and recharge battery.
- M. Input Tolerance:
1. Voltage Range: Plus 10/minus 15 percent of nominal.
  2. Frequency Range: Plus/minus 2.5 percent of nominal.
  3. Total Harmonic Distortion (THD): 3 percent maximum at full load.
- N. Output Requirements:
1. Voltage Regulation: Plus/minus 3 percent.
  2. Frequency Range: Plus/minus 0.5 Hz.
  3. Total Harmonic Distortion (THD): 3 percent maximum for linear load.
  4. Load Power Factor Capability: From 0.8 lagging to 0.8 leading.
- O. Features (Units Less than 500 VA):
1. Control Functions:
    - a. Automatic mode.
    - b. Manual Test Mode: Simulates failure of primary/normal source.
  2. Status Indications:
    - a. Connected to primary/normal source.
    - b. Connected to battery power.
    - c. Primary/normal source available.
    - d. Battery charging.
  3. Alarm Indications (Units with Self-Testing/Self-Diagnostics):
    - a. General trouble/alarm.
- P. Features (Units 500 VA and Larger):
1. Control Functions:
    - a. Automatic mode.
    - b. Manual Test Mode: Simulates failure of primary/normal source.
    - c. Automatic Shutdown Mode (IPS Inverters Only): Upon applicable inverter circuit trouble/fault unit shuts down.
    - d. Self-testing/self-diagnostics.
-

2. Status Indications:
  - a. Connected to primary/normal source.
  - b. Connected to battery power.
  - c. Primary/normal source available.
  - d. Battery charging.
3. Alarm Indications:
  - a. Output overload/overcurrent.
  - b. High temperature.
  - c. Low battery.
4. Other Features:
  - a. Input circuit breaker.
  - b. Event log.

## **2.2 FAST-TRANSFER INTERRUPTIBLE POWER SUPPLY (IPS) CENTRALIZED EMERGENCY LIGHTING INVERTERS**

- A. Description: Offline/standby or online, line interactive type inverters with maximum 2 ms transfer time to battery power source upon loss of normal power source; suitable for emergency operation of incandescent, LED, fluorescent, and HID light sources.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of inverter assemblies are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive inverter assemblies.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.2 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install inverter assemblies plumb and level.
- D. Unless otherwise indicated, mount floor-mounted inverter assemblies on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- E. Provide grounding and bonding in accordance with Section 26 05 26.
- F. Identify inverter assemblies and associated system wiring in accordance with Section 26 05 53.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.
- C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank.
- E. Prepare and start system in accordance with manufacturer's instructions.

- F. Perform acceptance test in accordance with NFPA 111.
- G. Inspect and test in accordance with NETA ATS, except Section 4.
- H. Perform inspections and tests listed in NETA ATS, Section 7.22.2.
- I. Batteries and Charger: Perform inspections and tests listed in NETA ATS, Section 7.18.
- J. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### **3.4 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.5 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

### **3.6 PROTECTION**

- A. Protect installed inverter assemblies from subsequent construction operations.

**END OF SECTION**

**SECTION 26 43 00**  
**SURGE PROTECTIVE DEVICES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Surge protective devices for distribution locations.
- B. Surge protective devices for branch panelboard locations.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 24 16 - Panelboards.

**1.3 ABBREVIATIONS AND ACRONYMS**

- A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
- B. SPD: Surge Protective Device.

**1.4 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

**1.5 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
- C. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
  - 1. UL 1449.
  - 2. UL 1283 (for Type 2 SPDs).
- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.6 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.7 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## 1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.
- C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

## PART 2 PRODUCTS

### 2.1 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
  - 1. Wye Systems: L-N, L-G, N-G, L-L.
  - 2. Delta Systems: L-G, L-L.
  - 3. Single Split Phase Systems: L-N, L-G, N-G, L-L.
  - 4. High Leg Delta Systems: L-N, L-G, N-G, L-L.
- E. UL 1449 Voltage Protection Ratings (VPRs):
  - 1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
  - 2. 240/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
  - 3. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.
  - 4. 480V Delta System Voltage: Not more than 1,800 V for L-G mode and 3,000 V for L-L mode.
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 1. Indoor clean, dry locations: Type 1.
  - 2. Outdoor locations: Type 3R.

### 2.2 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

- A. Distribution locations include SPDs connected to distribution panelboards, motor control centers, and busway.
- B. Surge Protective Device:
  - 1. Protection Circuits: Field-replaceable modular or non-modular.

2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.
3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
5. Diagnostics:
  - a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
  - b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
6. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.
- C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.
- D. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.2 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.
- D. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

### **3.4 CLEANING**

- A. Repair scratched or marred exterior surfaces to match original factory finish.

## **END OF SECTION**

**SECTION 26 51 00**  
**INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- B. Section 26 05 33.16 - Boxes for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

**1.3 REFERENCE STANDARDS**

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.
- E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- J. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
    - b. Include IES LM-79 test report upon request.

### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### 1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

### 1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

### 1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

## PART 2 PRODUCTS

### 2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### 2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
  - B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
  - C. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
-



- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
  - 1. Ceiling Compatibility: Comply with NEMA LE 4.
- H. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

### **2.3 EMERGENCY LIGHTING UNITS**

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
  - 1. Sealed maintenance-free lead calcium unless otherwise indicated.
  - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- G. Accessories:
  - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

### **2.4 EXIT SIGNS**

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
  - 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

### **2.5 BALLASTS AND DRIVERS**

- A. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.
  - a. Network Lighting Controls: See Section 260945.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.2 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.3 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
  - B. Perform work in accordance with NECA 1 (general workmanship).
  - C. Install products in accordance with manufacturer's instructions.
  - D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
  - E. Provide required support and attachment in accordance with Section 26 05 29.
  - F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
  - G. Suspended Ceiling Mounted Luminaires:
    1. Do not use ceiling tiles to bear weight of luminaires.
    2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
    3. Secure pendant-mounted luminaires to building structure.
    4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
    5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
  - H. Recessed Luminaires:
    1. Install trims tight to mounting surface with no visible light leakage.
    2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
  - I. Suspended Luminaires:
    1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
    2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
-

- J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- K. Install accessories furnished with each luminaire.
- L. Bond products and metal accessories to branch circuit equipment grounding conductor.
- M. Emergency Lighting Units:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- N. Exit Signs:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
  - 2. Install lock-on device on branch circuit breaker serving units.
- O. Install lamps in each luminaire.

### **3.4 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### **3.5 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

### **3.6 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### **3.7 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

### **3.8 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**SECTION 26 56 00**  
**EXTERIOR LIGHTING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.
- C. Poles and accessories.
- D. Luminaire accessories.

**1.2 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.
- F. Section 26 51 00 - Interior Lighting.

**1.3 REFERENCE STANDARDS**

- A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2022).
- B. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- C. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- G. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Provide photometric calculations where luminaires are proposed for substitution upon request.
  - 2. Provide structural calculations for each pole. Where applicable, include pole base, attachment arms, fixtures, and accessories such as cameras or lightning rods.
  - 3. Provide pole base design, signed and sealed by a Professional Engineer registered in the state of Alabama.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
    - b. Include IES LM-79 test report upon request.
  - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
  - 3. Lamps: Include rated life and initial and mean lumen output.
  - 4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- D. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires and accessories to be installed and comply with designated structural design criteria.
- E. Field Quality Control Reports.
  - 1. Include test report indicating measured illumination levels.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
  - 3. Touch-Up Paint: 2 gallons, to match color of pole finish.
- I. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

#### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

### **1.8 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

## **PART 2 PRODUCTS**

### **2.1 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.2 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- H. Exposed Hardware: Stainless steel.

### **2.3 BALLASTS AND DRIVERS**

- A. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
  - 3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

## 2.4 POLES

- A. All Poles:
  1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
  2. Structural Design Criteria:
    - a. Comply with AASHTO LTS.
    - b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
      - 1) Design Wind Speed: IBC or ASCE 7, with gust factor of 1.3.
    - c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
  3. Material: Steel, unless otherwise indicated.
  4. Shape: Square straight, unless otherwise indicated.
  5. Finish: Match luminaire finish, unless otherwise indicated.
  6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
  7. Unless otherwise indicated, provide with the following features/accessories:
    - a. Top cap.
    - b. Handhole.
    - c. Anchor bolts with leveling nuts or leveling shims.
    - d. Anchor base cover.
    - e. Provision for pole-mounted weatherproof GFI receptacle where indicated.

## 2.5 ACCESSORIES

- A. Camera mounting plate where indicated, with additional handhole adjacent to camera mount.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Pole-Mounted Luminaires:
  - 1. Maintain the following minimum clearances:
    - a. Comply with IEEE C2.
    - b. Comply with utility company requirements.
  - 2. Foundation-Mounted Poles:
    - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
      - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
      - 2) Position conduits to enter pole shaft.
    - b. Install foundations plumb.
    - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
    - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
    - e. Install anchor base covers or anchor bolt covers as indicated.
  - 3. Grounding:
    - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
    - b. Provide supplementary ground rod electrode as specified in Section 26 05 26 at each pole bonded to grounding system as indicated.
  - 4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
  - 5. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 27 26 in designated poles.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.

### **3.3 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

### **3.4 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

### **3.5 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.



**3.6 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

**3.7 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

## SECTION 27 05 28

### PATHWAYS FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Cable supports and positioning devices.
- B. Related Requirements:
  - 1. Section 260005 "Common Work Results for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
  - 2. Section 078413 "Penetration Firestopping" specifies firestopping for communications pathways installed by this Section.
  - 3. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding conductors and connectors for communications pathways installed by this Section.
  - 4. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports for communications pathways installed by this Section.
  - 5. Section 260533.13 "Conduits for Electrical Systems" specifies common raceway types installed by this Section:
  - 6. Section 260533.16 "Boxes and Covers for Electrical Systems" specifies boxes, extension rings, and covers.
  - 7. Section 260553 "Identification for Electrical Systems" specifies labels and warning signs for communications pathways installed by this Section.
  - 8. Section 262716 "Electrical Cabinets and Enclosures" for communications enclosures installed by this Section.

##### 1.2 ACTION SUBMITTALS

- A. Product Data:
  - 1. For each type of product.

##### 1.3 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1910.145 - Accident Prevention Signs and Tags; Current Edition.
- C. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).
- F. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

## **PART 2 PRODUCTS**

### **2.1 CABLE SUPPORTS AND POSITIONING DEVICES**

- A. Description: This category covers straps, hooks, and similar types of hardware for installation and use in communications cabling systems in accordance with NFPA 70 and manufacturer's installation instructions
- B. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. UL DWMU - J-Hook or G-Hook Cable Support:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ABB, Electrification Business
    - b. ADI
    - c. Cablofil; Legrand North America, LLC
    - d. Elite Components Inc.; subsidiary of SIGMA Piping Products (SPP) LLC
    - e. Panduit Corp
    - f. Southwire Company, LLC
  - 2. Source Limitations: Obtain products from single manufacturer.
  - 3. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
  - 4. Product Characteristics:
    - a. Material: Galvanized steel.
- D. UL DWMU - Conduit or Cable Support Strap:
  - 1. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
  - 2. Product Characteristics:
    - a. Conduit, Cable, or Tubing Bundle Capacity: as required.
  - 3. Required Product Options:
    - a. Suitable for use in air handling space.
- E. UL ZODZ - Cable Tie or Management System:
  - 1. Product Listing Criteria: UL CCN ZODZ; including UL 62275.
  - 2. Product Characteristics:
    - a. Classification: Type 2 or 21.
    - b. Bundle Capacity: as required.
    - c. Mechanical Strength: 80 N.
  - 3. Required Product Options:
    - a. UL 2043 Air-Handling Spaces Rating: AH-2 nonmetallic or composite components.

## **PART 3 EXECUTION**

### **3.1 SELECTION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS**

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Minimum Pathway Size:
  - 1. For Copper and Aluminum Cables: Metric designator 21 (trade size 3/4).
  - 2. For Optical-Fiber Cables: Metric designator 25 (trade size 1).
- C. Maximum Pathway Length Between Cable Access Points: 100 ft.
- D. Temperature Limitations:

1. Type PVC, Type HDPE, Type EPEC, Type OFR, and Type CR: Do not install where ambient temperature exceeds 104 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
- E. Outdoor Pathways:
  1. As specified in Section 260533.13 Conduit for Electrical Systems.
- F. Indoor Pathways:
  1. Other than as indicated below, as specified in Section 260533.13 Conduit for Electrical Systems.
    - a. Concealed above Suspended Ceilings: Cable tray, Hooks, or conduits.
- G. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
  1. ERMC and IMC: Provide threaded-type fittings unless otherwise indicated.
- H. Surface Raceways: Where indicated on Drawings.
- I. Cable Supports and Positioning Devices:
  1. Size hooks to allow minimum of 25 percent future capacity without exceeding design capacity limits.
  2. Support hooks directly from building structure. Do not use ceiling grid support rods or wires.
  3. Hook spacing must allow no more than 6 inch of slack. Lowest point of cables must be no closer than 12 inches to ceiling tiles, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
  4. Space hooks as indicated by cable manufacturer, but in no case more than 5 ft on center.
  5. Provide hook at each change in direction.
- J. Boxes and Enclosures:
  1. Outdoors, Aboveground: UL 50E Type 3R.
  2. Indoors: UL 50E Type 1, except use Type 4 nonmetallic units in institutional and commercial kitchens and damp or wet locations.

### 3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
  1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
  2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- B. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.
- C. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
  1. "COMMUNICATIONS."
  2. "FIRE ALARM."
  3. "SECURITY."
- D. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- E. Locations of Underground Lines: Underground-line warning tape for communication, control wiring, and optical-fiber cable.
- F. Equipment and Cabling Identification for Administrative Records and Labeling: Comply with TIA-606 requirements for Class 2 network administration.
- G. Horizontal Cables: Label each cable with a vinyl-wraparound label.

- H. Cover Plates: Identify cover plate in accordance with TIA-606.
- I. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.

### **3.3 SELECTION OF SIGNS AND HAZARD MARKINGS**

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
- B. Signs, labels, and tags required for personnel safety must comply with the following standards:
  - 1. Safety Colors: NEMA Z535.1.
  - 2. Facility Safety Signs: NEMA Z535.2.
  - 3. Safety Symbols: NEMA Z535.3.
  - 4. Product Safety Signs and Labels: NEMA Z535.4.
  - 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

### **3.4 INSTALLATION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS**

- A. Comply with manufacturers' published instructions, including limitations on distance, bends, and bend radius.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  - 1. General Installation Requirements: NFPA 70 and NECA NEIS 1
  - 2. Type OFR Optical-Fiber Raceways: Article 800 of NFPA 70 and BICSI N1.
  - 3. Type CR Communications Raceways: Article 800 of NFPA 70 and BICSI N1.
  - 4. Cable Supports and Positioning Devices: Article 800 of NFPA 70 and BICSI N1.
  - 5. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  - 1. Complete communications raceway installation before starting conductor installation.
  - 2. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
  - 3. Provide hangers and supports for pathways, boxes, and enclosures.
  - 4. Firestop pathway penetrations of fire-rated assemblies.
  - 5. Identification:
    - a. Provide colors and labels for pathways, boxes, enclosures, and associated communications equipment.
    - b. Provide safety warning signs.
- D. Interfaces with Other Work:
  - 1. Coordinate installation of new communications pathways with existing conditions.
  - 2. Grounding and Bonding: Bond metallic communications boxes and enclosures to metallic pathways.

### **END OF SECTION**

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## SECTION 27 11 16

### COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. 19-inch equipment racks.
  - 2. 19-inch freestanding and wall-mounted equipment cabinets.
  - 3. Surge-protected multi-outlet assemblies.
  - 4. Grounding.
  - 5. Labeling.
- B. Related Requirements:
  - 1. Section 260005 "Common Work Results for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
  - 2. Section 270528 "Pathways for Communications Systems" for installation of cable pathways serving communications equipment room fittings installed under this Section.
  - 3. Section 260526 "Grounding and Bonding for Electrical Systems" for grounding of equipment racks and cabinets.

##### 1.2 DEFINITIONS

- A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.
- B. BICSI: Building Industry Consulting Service International.
- C. LAN: Local area network.
- D. RCDD: Registered communications distribution designer.
- E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.
- F. TGB: Telecommunications grounding bus bar.
- G. TMGB: Telecommunications main grounding bus bar.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.
- B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
  - 3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Certificates, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.
  - 1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of RCDD.
  - 2. Installation Supervision: Installation shall be under direct supervision of Technician, who shall be present at all times when Work of this Section is performed at Project site.
  - 3. Field Inspector: Currently registered by BICSI as Technician to perform on-site inspection.

#### 1.6 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category C.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."
- B. UL listed.
- C. RoHS compliant.

#### 2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Section 061000 "Rough Carpentry."

#### 2.3 19-INCH EQUIPMENT RACKS

- A. Description: Four-post racks with threaded rails designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch equipment mounting with an opening of 17.72-inches between rails.
- B. General Requirements:
  - 1. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
  - 2. Material: Extruded steel or Extruded aluminum.
  - 3. Finish: Manufacturer's standard, baked-polyester powder coat.
  - 4. Color: Black.
- C. Floor-Mounted Racks:
  - 1. Overall Height: 84 inches or as indicated on Drawings.



2. Overall Depth: 23 inches.
3. Upright Depth: 3 inches.
4. Four-Post Load Rating: 1000 lb.
5. Number of Rack Units per Rack: 45 or as indicated on Drawings.

**"NUMBERING" SUBPARAGRAPH BELOW MAY DESCRIBE A FEATURE NOT AVAILABLE FROM ALL MANUFACTURERS.**

**NUMBERING: EVERY RACK UNIT, ON INTERIOR OF RACK.**

1. Threads: 10-32.
  2. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug.
  3. Base shall have a minimum of four mounting holes for permanent attachment to floor.
  4. Top shall have provisions for attaching to cable tray or ceiling.
  5. Self-leveling.
- B. Cable Management:
1. Metal, with integral wire retaining fingers.
  2. Baked-polyester powder coat finish.
  3. Vertical cable management panels shall have front and rear channels, with covers.
  4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

#### **4.2 SURGE-PROTECTED MULTI-OUTLET ASSEMBLIES**

- A. Power Strips: Comply with UL 1363.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Rack mounting.
  3. Eight 15-A, 120-V AC, NEMA WD 6, Configuration 5-15R receptacles.
  4. LED indicator lights for power and protection status.
  5. LED indicator lights for reverse polarity and open outlet ground.
  6. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
  7. Cord connected with 15-foot line cord.
  8. Rocker-type on-off switch, illuminated when in on position.
  9. Peak Single-Impulse Surge Current Rating: 26 kA per phase.
  10. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes shall be not more than 330 V.

#### **4.3 GROUNDING**

- A. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.
1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
  2. Rack-Mounted Horizontal TGB: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.

#### **4.4 LABELING**

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## **PART 3 EXECUTION**

### **5.1 INSTALLATION**

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout of communications equipment spaces.
- C. Comply with BICSI ITSIMM for installation of communications equipment spaces.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.
  - 1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
  - 2. Record agreements reached in meetings and distribute them to other participants.
  - 3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
  - 4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.
- F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

### **5.2 GROUNDING**

- A. Comply with NECA/BICSI 607.
- B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.
- C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.
  - 1. Where shielded or screen cable is installed, bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

### **5.3 IDENTIFICATION**

- A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."
- B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.
- D. Labels shall be machine printed. Type shall be 1/8 inch in height.

### **END OF SECTION**

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**SECTION 28 46 01**

**ADDRESSABLE FIRE-ALARM SYSTEMS**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Addressable fire-alarm system.
  - 2. Fire-alarm control unit (FACU).
  - 3. Fire-alarm auxiliary power supplies.
  - 4. Fire-alarm terminal cabinets
  - 5. Manual fire-alarm boxes.
  - 6. System smoke detectors.
  - 7. Duct smoke detectors.
  - 8. Carbon monoxide detectors.
  - 9. Heat detectors.
  - 10. Continuous linear heat detector system.
  - 11. Fire-alarm audio amplifiers
  - 12. Fire-alarm notification appliances.
  - 13. Fire-alarm remote annunciators.
  - 14. Fire-alarm addressable interface devices.
  - 15. Digital alarm communicator transmitters (DACTs).
  - 16. Fire-alarm radio transmitters.
  - 17. Fire-alarm cables.
  - 18. RF Survey for Emergency Responder Communications

**1.2 DEFINITIONS**

- A. DACT: Digital alarm communicator transmitter.
- B. EMT: Electrical metallic tubing.
- C. FACU: Fire-alarm control unit.
- D. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the 2007 Energy Independence and Security Act (EISA).
- E. NICET: National Institute for Certification in Engineering Technologies.
- F. PC: Personal computer.
- G. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - 1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
  - 2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

**1.3 ACTION SUBMITTALS**

- A. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, signed and sealed by a licensed professional engineer registered in the project's state or other applicable jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

- B. Product Data: For each type of product, including furnished options and accessories.
  - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
  - 2. Include rated capacities, operating characteristics, and electrical characteristics.
- C. Shop Drawings: For fire-alarm system.
  - 1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
  - 2. Include plans, elevations, sections, and details, including details of attachments to other Work.
  - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
  - 4. Detail assembly and support requirements.
  - 5. Include voltage drop calculations for notification-appliance circuits.
  - 6. Include battery-size calculations.
  - 7. Include input/output matrix.
  - 8. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
  - 9. Include performance parameters and installation details for each detector.
  - 10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within airflow range of air-sampling detector.
  - 12. Provide control wiring diagrams for fire-alarm interface to HVAC; coordinate location of duct smoke detectors and access to them.
    - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    - b. Show field wiring and equipment required for HVAC unit shutdown on alarm.
    - c. Locate detectors in accordance with manufacturer's written instructions.
    - d. Show air-sampling detector pipe routing.
  - 13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
  - 14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
- D. RF Survey Field Report
  - 1. Include test results for each building level, as applicable.
  - 2. Prepare floor plan drawings indicating RF field strength for each frequency band of interest.
    - a. Plan shall indicate areas that fail or pass test parameters.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Certificates:
    - 1. Seismic Performance Certificates: For FACU, accessories, and components, from manufacturer. Include the following information:
      - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
      - c. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
  - B. Field quality-control reports.
  - C. Qualification Statements: For Installer.
  - D. Sample Warranty: Submittal must include line item pricing for replacement parts and labor.
-

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
    - b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    - c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
    - d. Riser diagram.
    - e. Device addresses.
    - f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
    - g. Record copy of site-specific software.
    - h. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
      - 1) Equipment tested.
      - 2) Frequency of testing of installed components.
      - 3) Frequency of inspection of installed components.
      - 4) Requirements and recommendations related to results of maintenance.
      - 5) Manufacturer's user training manuals.
    - i. Manufacturer's required maintenance related to system warranty requirements.
    - j. Abbreviated operating instructions for mounting at FACU and each annunciator unit.
- B. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
  2. Program Software Backup: On USB media and approved online or cloud solution.
  3. Device address list.
  4. Printout of software application and graphic screens.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
  2. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
  3. Keys and Tools: One extra set for access to locked or tamper-proofed components.
  4. Audible and Visual Notification Appliances: One of each type installed.
  5. Fuses: Two of each type installed in system. Provide in box or cabinet with compartments marked with fuse types and sizes.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
  2. Installation must be by personnel certified by NICET as fire-alarm Level III technician.
  3. Obtain certification by NRTL in accordance with NFPA 72.
  4. Licensed or certified by authorities having jurisdiction.
-

- B. RF Survey Criteria and Qualifications
  - 1. Survey must be performed after the building shell is substantially complete but prior to start of installation of above ceiling utilities.
  - 2. Determine required radio signal levels by applicable code, AHJ, or with local fire service.
  - 3. Survey shall be completed by active FCC GROL license-holder.
  - 4. Comply with IFC 510

## 1.8 FIELD CONDITIONS

- A. Seismic Conditions: Unless otherwise indicated on Contract Documents, specified Work in this Section must withstand the seismic hazard design loads determined in accordance with ASCE/SEI 7 for installed elevation above or below grade.
  - 1. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic design loads and unit must be fully operational after seismic event."

## 1.9 REFERENCE STANDARDS

- A. IFC 510 - Emergency Responder Radio Coverage
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NECA 305 - Standard for Fire Alarm System Job Practices; 2018.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- H. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems; Current Edition, Including All Revisions.
- J. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.
- K. UL 268A - Standard for Smoke Detectors for Duct Application; Current Edition, Including All Revisions.
- L. UL 464 - Standard for Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- M. UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems; Current Edition, Including All Revisions.
- N. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- O. UL 1711 - Amplifiers for Fire Protective Signaling Systems; Current Edition, Including All Revisions.
- P. UL 1971 - Standard for Signaling Devices for the Hearing Impaired; Current Edition, Including All Revisions.

## PART 2 PRODUCTS

### 2.1 ADDRESSABLE FIRE-ALARM SYSTEM

- A. Description:
1. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice-and-strobe notification for evacuation. Fire alarm control unit(s) shall be compatible with selected manufacturer's multi-building campus systems and mass notification systems, such that fire alarm system(s) installed under this contract may be incorporated into a campus-wide system under a future project.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Autocall; brand of Johnson Controls International plc, Building Solutions North America
  2. Bosch Security Systems, Inc.
  3. Edwards; Carrier Global Corporation
  4. Fike Corporation
  5. Fire-Lite Alarms; Honeywell International, Inc.
  6. Gamewell-FCI; Honeywell International, Inc.
  7. Mircom Technologies, Ltd.
  8. Notifier; Honeywell International, Inc.
  9. Potter Electric Signal Company, LLC
  10. Siemens Industry, Inc., Building Technologies Division
  11. Silent Knight; Honeywell International, Inc.
  12. Simplex; brand of Johnson Controls International plc, Building Solutions North America
  13. Valcom, Inc. (Keltron Corporation)
- C. Performance Criteria:
1. Regulatory Requirements:
    - a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.
  2. General Characteristics:
    - a. Fire-alarm signal initiation must be by one or more of the following devices and systems:
      - 1) Manual stations.
      - 2) Heat detectors.
      - 3) Flame detectors.
      - 4) Smoke detectors.
      - 5) Duct smoke detectors.
      - 6) Carbon monoxide detectors.
      - 7) Combustible gas detectors.
      - 8) Automatic sprinkler system water flow.
      - 9) Preaction system.
      - 10) Fire-extinguishing system operation.
      - 11) Fire standpipe system.
      - 12) Dry system pressure flow switch.
      - 13) Fire pump running.
    - b. Fire-alarm signal must initiate the following actions:
      - 1) Continuously operate alarm notification appliances.
      - 2) Identify alarm and specific initiating device at FACU and remote annunciators.
      - 3) Transmit alarm signal to remote alarm receiving station.
      - 4) Unlock electric door locks in designated egress paths.
      - 5) Release fire and smoke doors held open by magnetic door holders.
      - 6) Activate voice/alarm communication system.
      - 7) Switch HVAC equipment controls to fire-alarm mode.
      - 8) Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.



- 9) Activate stairwell and elevator-shaft pressurization systems.
  - 10) Close smoke dampers in air ducts of designated air-conditioning duct systems.
  - 11) Activate preaction system.
  - 12) Recall elevators to primary or alternate recall floors.
  - 13) Activate elevator power shunt trip.
  - 14) Activate emergency lighting control.
  - 15) Activate emergency shutoffs for gas and fuel supplies, except for shutoffs serving legally required life-safety systems such as emergency generators and fire pumps.
  - 16) Record events in system memory.
  - 17) Record events by system printer.
  - 18) Indicate device in alarm on graphic annunciator.
- c. Supervisory signal initiation must be by one or more of the following devices and actions:
- 1) Valve supervisory switch.
  - 2) High- or low-air-pressure switch of dry-pipe or preaction sprinkler system.
  - 3) Alert and Action signals of air-sampling detector system.
  - 4) Elevator shunt-trip supervision.
  - 5) Independent fire-detection and -suppression systems.
  - 6) Fire pump is running.
  - 7) Fire pump has lost power.
  - 8) Power to fire pump has phase reversal.
  - 9) Zones or individual devices have been disabled.
  - 10) FACU has lost communication with network.
- d. System trouble signal initiation must be by one or more of the following devices and actions:
- 1) Open circuits, shorts, and grounds in designated circuits.
  - 2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  - 3) Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
  - 4) Loss of primary power at FACU.
  - 5) Ground or single break in internal circuits of FACU.
  - 6) Abnormal ac voltage at FACU.
  - 7) Break in standby battery circuitry.
  - 8) Failure of battery charging.
  - 9) Abnormal position of switch at FACU or annunciator.
  - 10) Voice signal amplifier failure.
  - 11) Hose cabinet door open.
- e. System Supervisory Signal Actions:
- 1) Initiate notification appliances.
  - 2) Identify specific device initiating event at FACU and remote annunciators.
  - 3) Record event on system printer.
  - 4) After time delay of 120 seconds, transmit trouble or supervisory signal to remote alarm receiving station.
  - 5) Transmit system status to building management system.
  - 6) Display system status on graphic annunciator.
- f. Network Communications:
- 1) Provide network communications for fire-alarm system in accordance with fire-alarm manufacturer's written instructions.
  - 2) Provide network communications pathway per manufacturer's written instructions and requirements in NFPA 72 and NFPA 70.
  - 3) Provide integration gateway using BACnet for connection to building automation system.

## 2.2 FIRE-ALARM CONTROL UNIT (FACU)

- A. Description: Field-programmable, microprocessor-based, modular, power-limited design with electronic modules.

- B. Performance Criteria:
1. Regulatory Requirements: Comply with NFPA 72 and UL 864.
  2. General Characteristics:
    - a. System software and programs must be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining information through failure of primary and secondary power supplies.
    - b. Include real-time clock for time annotation of events on event recorder and printer.
    - c. Provide communication between FACU and remote circuit interface panels, annunciators, and displays.
    - d. FACU must be listed for connection to central-station signaling system service.
    - e. Provide nonvolatile memory for system database, logic, and operating system and event history. System must require no manual input to initialize in the event of complete power down condition. FACU must provide minimum 500-event history log.
    - f. Addressable Initiation Device Circuits: FACU must indicate which communication zones have been silenced and must provide selective silencing of alarm notification appliance by building communication zone.
      - 1) Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: FACU must be listed for releasing service.
    - g. Alphanumeric Display and System Controls: Arranged for interface between human operator at FACU and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.
      - 1) Annunciator and Display: LCD, two line(s) of 40 characters, minimum.
      - 2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.
    - h. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
      - 1) Pathway Class Designations: NFPA 72, Class B.
      - 2) Pathway Survivability: Level 1.
      - 3) Install no more than 100 addressable devices on each signaling-line circuit.
      - 4) Install fault circuit isolators to comply with circuit performance requirements of NFPA 72 or with manufacturer's written instructions, whichever is more conservative.
    - i. Serial Interfaces:
      - 1) One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
      - 2) One USB port for PC configuration.
      - 3) One RS 232 port for air-aspirating smoke detector connection.
      - 4) One RS 232 port for voice evacuation interface.
    - j. Smoke-Alarm Verification:
      - 1) Initiate audible and visible indication of "alarm-verification" signal at FACU.
      - 2) Activate approved "alarm-verification" sequence at FACU and detector.
      - 3) Record events by system printer.
      - 4) Sound general alarm if alarm is verified.
      - 5) Cancel FACU indication and system reset if alarm is not verified.
    - k. Notification-Appliance Circuit:
      - 1) Audible appliances must sound in three-pulse temporal pattern, as defined in NFPA 72.
      - 2) Where notification appliances provide signals to sleeping areas, alarm signal must be 520 Hz square wave with intensity 15 dB above average ambient sound level or 5 dB above maximum sound level, or at least 75 dB(A-weighted), whichever is greater, measured at pillow.
      - 3) Visual alarm appliances must flash in synchronization where multiple appliances are in same field of view, as defined in NFPA 72.
    - l. Elevator Recall: Initiate by one of the following alarm-initiating devices:
      - 1) Elevator lobby detectors except lobby detector on designated floor.
      - 2) Smoke detectors in elevator machine room.

- 3) Smoke detectors in elevator hoistway.
  - m. Elevator controller must be programmed to move cars to alternate recall floor if lobby detectors located on designated recall floors are activated.
  - n. Water-flow alarm connected to sprinkler in elevator shaft and elevator machine room must shut down elevators associated with location without time delay.
    - 1) Water-flow switch associated with sprinkler in elevator pit may have delay to allow elevators to move to designated floor.
  - o. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls must be connected to fire-alarm system.
  - p. Remote Smoke-Detector Sensitivity Adjustment: Controls must select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out final adjusted values on system printer.
  - q. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to remote alarm station.
  - r. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of central-control microphone. Amplifiers must comply with UL 1711.
    - 1) Allow application of, and evacuation signal to, indicated number of zones and simultaneously allow voice paging to other zones selectively or in combination.
    - 2) Programmable tone and message sequence selection.
    - 3) Standard digitally recorded messages for "Evacuation" and "All Clear."
    - 4) Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of FACU.
  - s. Status Annunciator: Indicate status of various voice/alarm speaker zones and status of firefighters' two-way telephone communication zones.
  - t. Preamplifiers, amplifiers, and tone generators must automatically transfer to backup units, on primary equipment failure.
  - u. Primary Power: 24 V(dc) obtained from 120 V(ac) service and power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and DACT must be powered by 24 V(dc) source.
  - v. Alarm current draw of entire fire-alarm system must not exceed 80 percent of power-supply module rating.
  - w. Secondary Power: 24 V(dc) supply system with batteries, automatic battery charger, and automatic transfer switch.
  - x. Batteries: Sealed lead calcium.
- C. Accessories:
- 1. Instructions: Computer printout or typewritten instruction card mounted behind plastic or glass cover in stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe functional operation of system under normal, alarm, and trouble conditions.
  - 2. Preaction System Functionality:
    - a. Initiate Presignal Alarm: This function must cause audible and visual alarm and indication to be provided at FACU. Activation of initiation device connected as part of preaction system must be annunciated at FACU only, without activation of general evacuation alarm.

### 2.3 FIRE-ALARM AUXILIARY POWER SUPPLIES

- A. Description: An auxiliary source of low-voltage electrical operating power for fire-alarm system equipment, including the circuits and terminations connecting it to the equipment being powered. Auxiliary power supplies are often referred to as remote power supplies, booster power supplies, or notification appliance power supplies.
- B. Auxiliary Power Supplies:

1. Manufacturers: Subject to compliance with requirements, provide products by the control unit manufacturer.
2. Standard Features:
  - a. Product Reference Standards: Chs. 10 and 23 of NFPA 72
  - b. Quantity of 24 V(dc) auxiliary power circuits: as required by project, but no fewer than two.
3. Other Available Features Required by Project:
  - a. Synchronization of notification appliance circuits.

#### **2.4 FIRE-ALARM TERMINAL CABINETS**

- A. Description: A cabinet with hinged, lockable cover clearly labeled and intended for termination of fire-alarm conductors at junction points. Screw-type terminal blocks are provided within the terminal cabinet for conductor splices.
- B. Listing criteria: UL UOXX, including UL 864 and NFPA 72.
- C. Terminal Cabinets:
  1. Standard Features:
    - a. Labeled "FIRE ALARM TERMINAL CABINET"
    - b. Interior field identification labels.
    - c. Sized accordingly to contain required number of termination points, with a minimum of 20% spare terminals.

#### **2.5 MANUAL FIRE-ALARM BOXES**

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  1. Single-action mechanism, with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.
  2. Station Reset: Key- or wrench-operated switch.
  3. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm.
  4. Listed for environment in which manual fire alarm box is to be installed.

#### **2.6 SYSTEM SMOKE DETECTORS**

- A. Photoelectric Smoke Detectors:
  1. Performance Criteria:
    - a. Regulatory Requirements:
      - 1) NFPA 72.
      - 2) UL 268.
    - b. General Characteristics:
      - 1) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
      - 2) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
      - 3) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
      - 4) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
      - 5) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
      - 6) Operator at FACU, having designated access level, must be able to manually access the following for each detector:
        - (a) Primary status.

- (b) Device type.
- (c) Present average value.
- (d) Present sensitivity selected.
- (e) Sensor range (normal, dirty, etc.).
- 7) Remote Control: Unless otherwise indicated, detectors must be digital-addressable type, individually monitored at FACU for calibration, sensitivity, and alarm condition.
- 8) Rate-of-rise temperature characteristic of combination smoke- and heat-detection units must be selectable at FACU for 15 or 20 deg F per minute.
- 9) Fixed-temperature sensing characteristic of combination smoke- and heat-detection units must be independent of rate-of-rise sensing and must be settable at FACU to operate at 135 or 155 deg F.
- 10) Multiple levels of detection sensitivity for each sensor.

## 2.7 DUCT SMOKE DETECTORS

- A. Description: Photoelectric-type, duct-mounted smoke detector.
- B. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. NFPA 72.
    - b. UL 268A.
  - 2. General Characteristics:
    - a. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
    - b. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
    - c. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
    - d. Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
    - e. Operator at FACU, having designated access level, must be able to manually access the following for each detector:
      - 1) Primary status.
      - 2) Device type.
      - 3) Present average value.
      - 4) Present sensitivity selected.
      - 5) Sensor range (normal, dirty, etc.).
    - f. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with supplied detector for smoke detection in HVAC system ducts.
    - g. Each sensor must have multiple levels of detection sensitivity.
    - h. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
    - i. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

## 2.8 HEAT DETECTORS

- A. Fixed-Temperature-Type Heat Detectors:
  - 1. Performance Criteria:
    - a. Regulatory Requirements:
      - 1) NFPA 72.
      - 2) UL 521.
    - b. General Characteristics:
      - 1) Actuated by temperature that exceeds fixed temperature of 190 deg F.
      - 2) Mounting: Twist-lock base interchangeable with smoke-detector bases.
      - 3) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
      - 4) Detector must have functional humidity range of 10 to 90 percent.

## 2.9 FIRE-ALARM AUDIO AMPLIFIERS

- A. Description: A component of in-building fire emergency voice/alarm communications systems that takes a low-level audio input and amplifies the power output to distribute to fire-alarm loudspeakers. Amplifiers can be an integral component of the fire-alarm control unit or can be remotely located in a separate cabinet within the building.
- B. Audio Amplifiers:
  - 1. Listing Criteria: UL CCN UEAY2, including UL 1711, UL 1480, UL 1480A, UL 864, and NFPA 72.
  - 2. Standard Features:
    - a. Product Reference Standards: Chs 18, 23, and 24 of NFPA 72.
    - b. Supervised high-fidelity audio for emergency voice evacuation fire-alarm systems.
    - c. Frequency Response: 275 Hz - 6.5 kHz.
    - d. Speaker Outputs: 25V power limited
    - e. Minimum of four Class B speaker output circuits.
  - 3. Other Available Features Required by Project:
    - a. Minimum of four Class B synchronized strobe power circuits.
    - b. Four digitally pre-recorded voice messages.

## 2.10 FIRE-ALARM NOTIFICATION APPLIANCES

- A. Fire-Alarm Audible Notification Appliances:
  - 1. Description: Horns, bells, or other notification devices that cannot output voice messages.
  - 2. Performance Criteria:
    - a. Regulatory Requirements:
      - 1) NFPA 72.
    - b. General Characteristics:
      - 1) Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
      - 2) Audible notification appliances must have functional humidity range of 10 to 95 percent relative humidity.
      - 3) Horns: Electric-vibrating-polarized type, 24 V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. from horn, using coded signal prescribed in UL 464 test protocol.
      - 4) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- B. Fire-Alarm Voice/Tone Notification Appliances:
  - 1. Description: Notification appliances capable of outputting voice evacuation messages.
  - 2. Performance Criteria:
    - a. Regulatory Requirements:
      - 1) NFPA 72.
      - 2) UL 1480.
    - b. General Characteristics:
      - 1) Speakers for Voice Notification: Locate speakers for voice notification to provide intelligibility requirements of "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
      - 2) High Range Units: Rated 2 to 15 W.
      - 3) Low Range Units: Rated 1 to 2 W.
      - 4) Mounting: Semi-flush, unless otherwise indicated on drawings.
      - 5) Matching Transformers: Tap range matched to acoustical environment of speaker location.
    - c. Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system

connections.

- C. Fire-Alarm Visible Notification Appliances:
  - 1. Performance Criteria:
    - a. Regulatory Requirements:
      - 1) NFPA 72.
      - 2) UL 1971.
    - b. General Characteristics:
      - 1) Rated Light Output:
        - (a) 15/30/75/110 cd, selectable in field.
      - 2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
      - 3) Mounting: Wall mounted unless otherwise indicated.
      - 4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
      - 5) Flashing must be in temporal pattern, synchronized with other units.
      - 6) Strobe Leads: Factory connected to screw terminals.
      - 7) Mounting Faceplate: Factory finished, white.

## 2.11 FIRE-ALARM REMOTE ANNUNCIATORS

- A. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. NFPA 72.
  - 2. General Characteristics:
    - a. Annunciator functions must match those of FACU for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACU, including acknowledging, silencing, resetting, and testing.
      - 1) Mounting: Flush cabinet, NEMA 250, Type 1.
    - b. Display Type and Functional Performance: Alphanumeric display and LED indicating lights must match those of FACU. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

## 2.12 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

- A. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. NFPA 72.
  - 2. General Characteristics:
    - a. Include address-setting means on module.
    - b. Store internal identifying code for control panel use to identify module type.
    - c. Listed for controlling HVAC fan motor controllers.
    - d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.
    - e. Integral Relay: Capable of providing direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.
      - 1) Allow control panel to switch relay contacts on command.
      - 2) Have minimum of two normally open and two normally closed contacts available for field wiring.
    - f. Control Module:
      - 1) Operate notification devices.
      - 2) Operate solenoids for use in sprinkler service.

## 2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTERS (DACTS)

- A. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. NFPA 72.
  - 2. General Characteristics:

- a. DACT must be acceptable to remote central station and must be listed for fire-alarm use.
- b. Functional Performance: Unit must receive alarm, supervisory, or trouble signal from FACU and automatically capture telephone line(s) and dial preset number for remote central station. When contact is made with central station(s), signals must be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter must initiate local trouble signal and transmit signal indicating loss of telephone line to remote alarm receiving station over remaining line. Transmitter must automatically report telephone service restoration to central station. If service is lost on both telephone lines, transmitter must initiate local trouble signal.
- c. Local functions and display at DACT must include the following:
  - 1) Verification that both telephone lines are available.
  - 2) Programming device.
  - 3) LED display.
  - 4) Manual test report function and manual transmission clear indication.
  - 5) Communications failure with central station or FACU.
- d. Digital data transmission must include the following:
  - 1) Address of alarm-initiating device.
  - 2) Address of supervisory signal.
  - 3) Address of trouble-initiating device.
  - 4) Loss of ac supply.
  - 5) Loss of power.
  - 6) Low battery.
  - 7) Abnormal test signal.
  - 8) Communication bus failure.
- e. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

#### 2.14 FIRE-ALARM RADIO TRANSMITTERS

- A. Description: A fire-alarm system component at the protected premises to which the fire-alarm control unit connects and transmit signals indicating a status change of initiating devices or groups of devices. The RAT transmits signals through a dedicated, licensed radio channel to the radio alarm receiver.
- B. Radio Transmitter:
  1. Listing Criteria: Investigated, labeled, and marked by qualified electrical laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Control Unit Accessories for Fire-Protective Signaling Systems: UL CCN UOXXD, including UL 864 and NFPA 72.
  2. Standard Features:
    - a. Product Reference Standards: Ch 26 of NFPA 72.
    - b. Modular UL 50E, Type 1 metal enclosure with tamper-resistant flush tumbler lock.
    - c. Compatible and coordinated with operating characteristics of remote-alarm receiving-station receiver.
    - d. Receive alarm, supervisory, or trouble signals from FACU and automatically transmit to remote alarm receiving station via radio frequency using 2-W power output.
      - 1) Confirm frequency band and coding requirements with receiving station / local fire authority.
    - e. Indicate trouble signal at FACU upon loss of communication with the remote alarm receiving station.
    - f. Indicate local trouble signal upon loss of communication with the FACU.
    - g. Normal Power Input: 120 V(ac).
    - h. Secondary Power: Integral sealed, rechargeable, 12 V battery and charger.
    - i. Omnidirectional, coaxial half-wave, dipole-type antenna with driving point impedance matched to transmitter and antenna cable output impedance.
    - j. Dry-contact inputs and serial communications interface to receive connections from fire-alarm system circuit boards, modules, and other auxiliary devices



- k. Digital data transmission of the following signals:
  - 1) Address of alarm-initiating device.
  - 2) Address of supervisory signal.
  - 3) Address of trouble-initiating device.
- l. Loss of AC supply.
- m. Loss of power.
- n. Low battery.
- o. Abnormal test signal.
  - 1) Communication bus failure.
- p. Self-test automatically performed every 24 hours with report transmitted to remote alarm receiving station.

## 2.15 FIRE-ALARM CABLES

- A. Power-Limited Fire-Alarm Plenum Cable (FPLP):
  - 1. Listing Criteria:
    - a. Power-Limited Fire-Alarm Cable: UL CCN HNIR; including UL 1424 and Article 760 of NFPA 70.
    - b. Vertical-Tray Flame Test: UL 1685.
    - c. Limited Smoke "ST1" Marking: UL 1685 or UL 2556.
    - d. Plenum Rating: NFPA 262.
  - 2. Standard Features:
    - a. Solid or stranded copper conductors with 300 V rated, 167 degrees Fahrenheit, color-coded insulation.
    - b. Minimum Conductor Size: 16 AWG.
- B. Power-Limited Fire-Alarm Riser Cable (FPLR):
  - 1. Listing Criteria:
    - a. Power-Limited Fire-Alarm Cable: UL CCN HNIR; including UL 1424 and Article 760 of NFPA 70.
    - b. Vertical-Tray Flame Test: UL 1685.
    - c. Limited Smoke "ST1" Marking: UL 1685 or UL 2556.
    - d. Riser Rating: UL 1666.
  - 2. Standard Features:
    - a. Solid or stranded copper conductors with 300 V rated, 167 degrees Fahrenheit, color-coded insulation.
    - b. Minimum Conductor Size: 16 AWG.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
  - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 RF SURVEY FOR EMERGENCY RESPONDER COMMUNICATIONS

- A. Unless otherwise indicated or required by AHJ or local fire service, minimum signal strength shall be based on a -95dBm nominal signal.
- B. Test equipment shall have been calibrated within one calendar year.

- C. Test areas shall consist of a minimum 20 grid points per floor/level. If floor area exceeds 32,000 square feet, maximum test area shall not exceed 1,600 square feet.
- D. Test shall include all critical areas as identified by NFPA or local authorities.

### **3.3 INSTALLATION OF EQUIPMENT**

- A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
  - 1. Devices placed in service before other trades have completed cleanup must be replaced.
  - 2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.
- B. Install wall-mounted equipment, with tops of cabinets not more than 78 inch above finished floor.
  - 1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."
- C. Manual Fire-Alarm Boxes:
  - 1. Install manual fire-alarm box in normal path of egress within 60 inch of exit doorway.
  - 2. Mount manual fire-alarm box on background of contrasting color.
  - 3. Operable part of manual fire-alarm box must be between 42 and 48 inch above floor level. Devices must be mounted at same height unless otherwise indicated.
- D. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.
- E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend full width of duct. Tubes more than 36 inch long must be supported at both ends.
  - 1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- F. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.
- G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within dwelling or suite, they must be connected so that operation of smoke alarm causes alarm in smoke alarms to sound.
- H. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- I. Audible Alarm-Indicating Devices: Install not less than 6 inch below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.
- J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch below ceiling. Install devices at same height unless otherwise indicated.
- K. Device Location-Indicating Lights: Locate in public space near device they monitor.

### **3.4 ELECTRICAL CONNECTIONS**

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
  - 1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

### 3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
- C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

### 3.6 PATHWAYS

- A. Pathways above recessed ceilings and in inaccessible locations may be routed exposed.
  - 1. Exposed pathways located less than 96 inch above floor must be installed in EMT.
- B. Exposed EMT must be painted red enamel.

### 3.7 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
  - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with supervised interface device to the following devices and systems, as applicable. Install interface device less than 36 inch from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
  - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
  - 2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
  - 3. Smoke dampers in air ducts of designated HVAC duct systems.
  - 4. Magnetically held-open doors.
  - 5. Electronically locked doors and access gates.
  - 6. Alarm-initiating connection to elevator recall system and components.
  - 7. Alarm-initiating connection to activate emergency lighting control.
  - 8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
  - 9. Supervisory connections at valve supervisory switches.
  - 10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
  - 11. Supervisory connections at elevator shunt-trip breaker.
  - 12. Data communication circuits for connection to building management system.
  - 13. Data communication circuits for connection to mass notification system.
  - 14. Supervisory connections at fire-extinguisher locations.
  - 15. Supervisory connections at fire-pump power failure including dead-phase or phase-reversal condition.
  - 16. Supervisory connections at fire-pump engine control panel.

### 3.8 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

- B. Install framed instructions in location visible from FACU.

### **3.9 GROUNDING**

- A. Ground FACU and associated circuits in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Ground shielded cables at control panel location only. Insulate shield at device location.

### **3.10 FIELD QUALITY CONTROL**

- A. Administrant for Tests and Inspections:
  - 1. Administer and perform tests and inspections.
- B. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    - b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.
  - 2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
- C. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### **3.11 DEMONSTRATION**

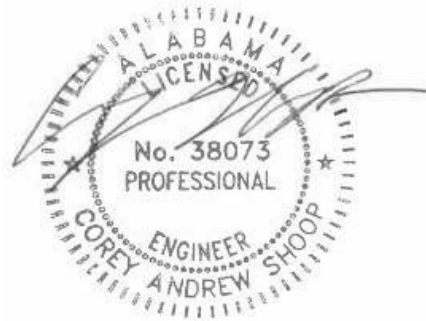
- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Allow Owner to record training.

### **3.12 SOFTWARE SERVICE AGREEMENT**

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement must include software support for two years.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software must include operating system and new or revised licenses for using software.

### **END OF SECTION**

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09/27/2024

Applicable for Sections: 02 4100, 31 1000, 31 2000, 31 2500, 32 1216, 32 1313, 32 1613,  
32 1723, 33 1000, 33 3000, and 33 4001

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**SECTION 31 1000**

**SITE CLEARING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes Sections:
  - .. Section 31 2000 - "Earth Moving"
  - .. Section 02 4100 - "Demolition"

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Protection of existing trees and landscaping to remain, if any, and boundary and property line markers, bench marks, survey control points, and existing structures and improvements which are to remain.
  - 2. Environmental and erosion control measures, as indicated and as otherwise required by applicable codes, regulations, and authorities having jurisdiction.
  - 3. Removal of trees and other vegetation, as indicated, and within "controlled areas."
  - 4. Topsoil stripping, and stockpiling, as indicated, and within "controlled areas."
  - 5. Removing above-grade improvements as indicated, and as required to accommodate new construction.
  - 6. Removing below-grade improvements as indicated, and as required to accommodate new construction.

**1.3 PROJECT CONDITIONS**

- A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction, unless specifically indicated elsewhere in contract documents.
- B. Protection of Existing Improvements:

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1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place. Clearing, demolition and any excavation within 5'-0" of existing buildings and structures to remain shall be performed by hand.
  2. Protect improvements on adjoining properties and on Owner's property.
  3. Protect boundary and property line markers, bench marks, and survey control points.
  4. Restore damaged improvements and markers to their original condition, as acceptable to property owners.

## **PART 2 - PRODUCTS**

- A. Not applicable to this Section.

## **PART 3 - EXECUTION**

### **3.1 SITE CLEARING**

- A. General:
  1. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated.
- B. Topsoil:
  1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.
  2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
    - a. Remove heavy growths of grass from areas before stripping.
  3. Stockpile topsoil in storage piles in areas as indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, as required, to prevent wind erosion, or seed and mulch if left undisturbed for a period of time greater than 14 consecutive days.
  4. Legally dispose of off-site unsuitable soil, excess topsoil not to be stockpiled, and waste material debris.
  5. Fill depressions caused by site clearing operations with satisfactory soil material, unless further excavation or earthwork is indicated.



- a. Place fill material in horizontal layers not exceeding 8 inches loose depth, and thoroughly compact to a density equal to adjacent original ground, unless specific compaction is otherwise indicated in Section 31 2000 “Earth Moving”, or, as directed in the geotechnical investigation.

### 3.2 DISPOSAL OF WASTE MATERIALS

- A. Burning on Owner’s Property: Burning will not be permitted on Owner’s property.
- B. Removal from Owner’s Property: Remove waste materials, trash and debris, and legally dispose of same off site.

**END OF SITE CLEARING**

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**SECTION 31 2000**

**EARTH MOVING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - .. Section 01 2200 - "Unit Prices"
  - .. Section 01 7800 - "Closeout Submittals"
  - .. Section 02 3213 - "Subsurface Investigation"
  - .. Section 31 1000 - "Site Clearing", "Report of Geotechnical Investigation"
  - .. Section 32 1313 - "Concrete Paving"
  - .. Section 03 3100 - "Concrete"
  - .. Division 22 - "Plumbing"
  - .. Division 23 - "Heating, Ventilating, and Air Conditioning"
  - .. Division 26 - "Electrical"

**1.2 SUMMARY**

- A. This Section includes unclassified excavation, grading and fill as follows:
  - 1. Preparing of subgrade for building slabs, walks, and pavements; and additional work indicated on the Drawings and in the Project Manual.
    - a. Comply with recommendations in the Owner's "Report of Geotechnical Exploration", this Section, and other Division 31 Sections; Refer also to Civil and Structural Drawings for additional information and requirements.
    - b. Undercutting of building area as indicated in the Report of Geotechnical Investigation and in the Contract Documents.
    - c. Perform excavation by hand within 5'-0" of existing buildings and structures to remain. Design and provide all necessary supports, shoring, etc., as required to prevent settlement, collapse, and/or other damage to existing buildings and structures to remain.
      - 1) DO NOT EXCAVATE BELOW THE EFFECTIVE BEARING AREA OF FOUNDATIONS OF EXISTING BUILDINGS AND STRUCTURES. In the event of conflict during construction, notify Architect prior to proceeding with work in the effected area.

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- d. Compaction of backfill at any basement and below grade walls shall only be by hand-directed compaction equipment. Heavy construction equipment and/or heavy trucks shall not be allowed within 10-feet of any basement walls, and within 5-feet of foundation walls.
  2. Drainage fill course (porous fill) for support of building slabs is included as part of this work; compacted in place.
  3. Excavating and backfilling of trenches within building control areas and on site.
  4. Stripping and stockpiling of topsoil (if any) is specified in Section 31 1000 - Site Clearing.
  5. The extent of earthwork is indicated on the Drawings. This earthwork is to be included in the base bid as unclassified excavation, regardless of material encountered.
  6. Removal of existing improvements may also be specified under various Division 31 Sections.
- B. Excavating and Backfilling for Plumbing, HVAC, and Electrical Work: Refer to Divisions 22, 23, and 26 sections for excavation and backfill required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances, not work of this Section.
1. However, construction materials and execution for Plumbing, HVAC, and Electrical work shall comply with requirements of this Section, and related Division 31 Sections, when the work and/or materials required are not indicated or only partially indicated in Divisions 22, 23, and 26.
- C. Placement and compaction of at least 4-inches of topsoil up to finish grades is included in the work of this Section.
1. Allow for thickness of topsoil and sod.

### 1.3 DEFINITIONS

- A. "Excavation" consists of removal of materials and existing improvements encountered to subgrade elevations indicated, and subsequent disposal of materials removed.
- B. "Unauthorized" excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Geotechnical Engineer. Unauthorized excavation, as well as remedial work directed by Owner's Geotechnical Engineer, shall be at Contractor's expense.
1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Owner's Geotechnical Engineer.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner's Geotechnical Engineer.
- C. "Additional Excavation": When excavation has reached required subgrade elevations, notify Owner's Geotechnical Engineer, who will make an inspection of conditions. If Owner's Geotechnical Engineer determines that bearing materials at required subgrade elevations are unsuitable, continued excavation may be required. If additional excavation is required, replace excavated material as directed by Owner's Geotechnical Engineer.
1. The Contract Sum will be adjusted by Change Order, or as provided in General Conditions, for additional excavation, measured in place (Bank Measure), and its replacement appropriately authorized in writing prior to beginning the work, and for which the Contractor is due payment from the Owner.
- D. "Subgrade": The undisturbed earth or the compacted soil layer immediately below pavement base course, select drainage fill, bottom of indicated undercut areas, or topsoil materials.
- E. "Structure": Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.
- F. "Building Control Area" and/or "Controlled Area": Below and at least 10-feet beyond building foot print or exterior walls, and below roofs, to include covered porches and canopies, and below and at least 5-feet beyond all walks and pavements subject to bearing vehicular traffic.
- G. "Mud Footings" (if any): The at least 2-inches to 4-inches of lean 2,500 psi (minimum) concrete placed in the bottom of footing and foundation trenches and excavations, which is required if permanent or structural concrete cannot be placed the same day they are excavated.
1. Unless mud footings are indicated on Structural Drawings, their depth shall be compensated for by over-excavation.
  2. Mud footings (if any) shall be completely clean prior to placement of any reinforcing and/or permanent or structural concrete.
  3. Refer to the Owner's "Geotechnical Investigation" Report, and Structural Drawings for additional information and requirements for other "mud footings" (or "mud mats", or "mud seals").
- H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

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1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 19,000 lbf; measured according to SAE J-1179.
  2. Bulk Excavation: Late-model, track-mounted dozer equipped with a single tooth ripper; rated at not less than 250-hp flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.
  3. Refer to “Owner’s Report of Geotechnical Exploration” for additional information regarding recommendations when rock is encountered.

#### **1.4 SUBMITTALS**

- A. Test Reports: Submit the following reports directly to Architect, Civil Engineer, Structural Engineer, and the Owner, directly from the testing service, with copy to Contractor:
  1. Test reports on fill and borrow material.
  2. Verification of suitability of each foundation, floor slab and subgrade condition and material, in accordance with specified requirements.
  3. Field reports; and in-place soil density tests.

#### **1.5 QUALITY ASSURANCE**

- A. Codes and Standards: Perform excavation work on site and in right-of-ways in compliance with applicable requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: All required soil testing and inspection services during earthwork operations shall be performed by a qualified independent geotechnical testing laboratory.
  1. Refer to Section 01 0150 - “Special Conditions”, for additional information and requirements.

#### **1.6 PROJECT CONDITIONS**

- A. Site Information: Refer to Section 31 1000 - “Site Clearing”, and Civil Drawings, for additional information and recommendations.
- B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations in the vicinity, and as may also be required for other construction work.
  1. Notify the Alabama Line Location Center at 1-800-292-8525 at least 2-full working days (48 hours), excluding weekends and holidays, and the City of Fort

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Payne a minimum of 5 days prior to any excavation work. This organization will contact its member utility companies to locate and mark all of their own underground facilities.

- a. Notify non-member companies directly, for them to perform this service.
  2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions and record locations on as-built record drawings. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  3. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.
    - a. Provide minimum of 48-hour notice to Owner and copy Architect, and receive written notice to proceed before interrupting any utility.
  4. Demolish and completely remove from the site any existing underground utilities to be removed, and all existing underground utilities in "controlled areas". Coordinate with utility companies for shutoff of services if lines are active.
- C. Use of Explosives: **Use of explosives is not permitted.**
- D. Protection of Persons and Property:
1. Barricade open excavations occurring as part of this work and post with warning lights.
  2. Operate warning lights as recommended by authorities having jurisdiction.
  3. Comply with requirements of current regulations of OSHA, applicable Codes, ordinances, and authorities having jurisdiction.
  4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
  5. Perform excavation by hand within 5'-0" of existing buildings and structures to remain, and within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap. Paint root cuts of 1-inch and larger with emulsified asphalt tree paint.
    - a. Do not under-mine or excavate below footings and/or foundations which are to remain.

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**PART 2 - PRODUCTS**

**2.1 SOIL MATERIALS - DEFINITIONS**

- A. Satisfactory soil materials are defined as clean, non-saturated, non-organic sections of earth taken from acceptable sources, and complying with ASTM D2487 soil classification groups included in recommendations of the Owner’s “Report of Geotechnical Exploration”, or if not included, as directed at the time of earthwork operations and/or acceptance resulting from acceptable test results obtained on soil materials proposed by the Contractor and tested by the project Geotechnical Engineer, as required by the Bid and Contract Documents.

<b>Liquid Limit (LL)</b>	<b>Less than 50%</b>
<b>Plasticity Index (PI)</b>	<b>Less than 30%</b>
<b>Maximum Dry Density (ASTM D-698)</b>	<b>Greater than 95 pcf</b>
<b>Maximum Particle Size</b>	<b>3 inches or less</b>
<b>Organic Matter</b>	<b>Less than 5%</b>

- B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups other than those indicated above.
- C. Drainage Fill (or “porous fill” or “drainage aggregate”): Clean, washed, evenly graded mixture of free-draining pea gravel, coarse sand, or crushed stone, with not more than 50 percent passing a No. 50 sieve and not more than 5 percent passing a No. 200 sieve, and subject to approval by the project geotechnical engineer and testing laboratory; **Minimum 4-inches compacted completed thickness.**
- D. Backfill and Fill Materials (Grassed areas only; Cuts and fills outside “controlled areas”, during general grading): Satisfactory soil materials from on-site excavations, free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious material.
1. All fill soils must be compatible with existing soils, so they can bond together.
- E. Topsoil: Refer to Section 31 1000 - “Site Clearing.”
- F. Rock Fill: Refer to Owner’s “Report of Geotechnical Investigation” for recommendations regarding placement and compaction requirements.

**PART 3 - EXECUTION**

**3.1 PROOFROLLING**

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- A. Areas throughout significant slopes and beneath and 10'-0" beyond new building and covered areas, and beneath and 5'-0" beyond new pavement areas (back-of-curb or other paving edge termination) shall be designated as "controlled areas." Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a loaded tandem axle dump truck or similar approved equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the "controlled areas". If any areas fail the proofroll, repair these areas as directed by the Owner's Geotechnical Engineer.
1. Proofrolling shall be conducted in the presence of testing lab's Geotechnical Engineer.
  2. Do not proofroll when the ground surface is wet or saturated with water.

### 3.2 EXCAVATION

- A. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as structures, foundations, rock or unauthorized excavation.
- B. Perform excavation by hand within 5'-0" of existing buildings and structures to remain.
1. Do not under-mine or excavate below footings and/or foundations which are to remain.
- C. Refer to "Definitions" paragraph above for any "mud footings" required.

### 3.3 STABILITY OF EXCAVATIONS

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

### 3.4 DEWATERING

- A. Prevent surface water and Geotechnical or ground water from flowing into excavations and from flooding project site and surrounding area.



1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Contractor to provide and maintain, at their expense, pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
3. Due to the types of soil that exist on site, seepage and/or springs may occur. If excessive seepage or springs are discovered, notify Owner's Geotechnical Engineer and Architect immediately.

### **3.5 STORAGE OF EXCAVATED MATERIALS**

- A. Stockpile excavated materials acceptable for backfill and fill only within the limits of the area under construction. No stockpiling will be allowed in areas that are not under construction. If there is not room for stockpiling, then the contractor will be responsible for legally disposing of the material and will not get additional compensation for the replacement of that material if fill is needed. Place, grade, and shape stockpiles for proper drainage.
  1. Locate and retain soil materials away from edge of excavations.
  2. Dispose of excess excavated soil material by removal and legal disposal off-site.

### **3.6 EXCAVATION FOR STRUCTURES**

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
  1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
  2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus, a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.
  3. The contractor shall include in the base bid, the cost of the volume of undercut and removal of existing material within the building control areas, building areas

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plus 10 feet, to provide 18 inches of low plasticity soil below subgrade, for a volume of 2480 CY. If any additional undercut is required, the contractor shall be paid by unit price through an allowance according to Section 01 2100 "Allowances". The undercut will be replaced with acceptable structural fill, as specified in the Owner's Geotechnical Investigation. And properly compacted. All excess undercut will be disposed of off-site at the contractor's expense.

### **3.7 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.
  - 1. The contractor shall include in the base bid, the cost of the volume of undercut and removal of existing material within the pavement control areas, pavement areas plus 5 feet, for a volume of 2080 CY. If any additional undercut is required, the contractor shall be paid by unit price through an allowance according to Section 01 2100 "Allowances". The undercut will be replaced with acceptable structural fill, as specified in the Owner's Geotechnical Investigation, and properly compacted. All excess undercut will be disposed of off-site at the contractor's expense.

### **3.9 TRENCH EXCAVATION FOR PIPES AND CONDUIT**

- A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6-inches to 9-inches of clearance on both sides of pipe or conduit.
- B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on minimum of 4-inches of compacted "select fill" bedding. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- C. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage, etc.) so top of piping is not less than 2'-0" below finished grade and/or paving.
- D. Where rock or concrete is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of dense graded crushed stone, prior to installation of pipe.

### **3.10 COLD WEATHER PROTECTION**

- A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

### **3.11 BACKFILL AND FILL**

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
  - 1. Under all areas, use satisfactory excavated or borrow material. Refer to Owner's "Report of Geotechnical Exploration", and this Section, for minimum testing requirements.

2. Under building slabs, use drainage fill material of compacted and finished depth indicated, or if not indicated, **at least 4-inches** compacted and completed thickness.
  3. Backfill trenches with concrete where trench excavations pass within 18-inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
    - a. Concrete is specified in Division 3.
    - b. Do not backfill trenches until inspections and any required testing have been made and backfilling is authorized by Architect based on test results. Use care in backfilling to avoid damage or displacement of pipe systems.
    - c. Utility trenches shall be backfilled with acceptable borrow or dense graded aggregate in 6" loose lifts compacted with mechanical piston tampers to the project requirements. Open graded stone is not to be used as backfill.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, etc.
  2. Inspections, testing, approval, and recording locations of underground utilities have been performed and recorded.
  3. Removal of concrete formwork, if any.
  4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
    - a. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
  5. Removal of trash and debris from excavation.
  6. Permanent or temporary horizontal bracing is in place on horizontally supported walls, where necessary.

### 3.12 PLACEMENT AND COMPACTION - GENERAL

- A. Ground Surface Preparation:
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1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1-vertical to 4-horizontal so that fill material will bond with existing surface.
  2. Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a loaded tandem axle dump truck or similar approved equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the “controlled areas”. If any areas fail the proofroll, repair these areas as directed by the Owner’s Geotechnical Engineer.
    - a. Proofrolling shall be conducted in the presence of testing lab’s Geotechnical Engineer.
    - b. Do not proofroll when the ground surface is wet or saturated with water.
- B. Place backfill and fill materials in layers not more than 8-inches in loose depth for material compacted by heavy compaction equipment, and not more than 4-inches in loose depth for material compacted by hand-operated tampers.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- E. General Fill Embankment Construction
1. Embankment construction shall commence at the toe of the proposed slope and continue upwards as additional fill is placed. The engineered fill placed shall be benched into the natural slopes.
  2. The embankment is to be overfilled and then cut back to the required geometry to remove the uncompacted material that is usually present on the face of fill slopes.
  3. The face of slopes shall be promptly vegetated according to the Erosion Control Plan, and the CBMPP to prevent erosion after construction. Prior to vegetation 4” minimum topsoil is to be placed and tracked in by a dozer moving up and down the slope to create horizontal track lines.
- F. Rock Fill:
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1. Rock Fill is not to be used unless acceptable to the Owner's Geotechnical Engineer. Break larger particles down to 4" or less and treat as soil fill.
- G. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Owner's Geotechnical Engineer if soil density tests indicate inadequate compaction.
1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 698 A:
    - a. Under structures, building foundations and slabs, and 10' beyond those perimeters, compact full depth of fill placement and scarify, moisture condition and re-compact in accordance with the recommendations made in the Owner's "Report of Geotechnical Exploration".
      - 1) Cut areas shall be proof rolled prior to and during scarification efforts and observed by the Owner's Geotechnical Engineer.
    - b. Under steps, covered areas, sidewalks, mechanical/utility and in all "controlled areas", compact in accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".
    - c. Under pavements and at least 5-feet beyond (measured from back-of-curb or edge of paving, where occurs), remove loose soils as described in this and replace with suitable material that is compacted to 98% standard proctor.
    - d. Under lawn or unpaved areas beyond "controlled areas", compact each layer of backfill or fill material in accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".
    - e. On-site Borrow (where allowed): In accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".
    - f. Select and/or Structural Fill: In accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".
    - g. Porous Fill (drainage course): In accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".
  2. Moisture Control:
    - a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to
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prevent free water from appearing on surface during or subsequent to compaction operations.

- b. Remove and replace, or scarify and moisture condition, soil material that is too wet to permit compaction to specified density.
- c. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist moisture conditioning by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
- d. At the time of densification, the moisture content of “engineered fill”, “structural fill”, and “select fill” should be within -3% to +3% of the materials’ ASTM D-698 optimum moisture content.
- e. Structural fill areas exposed to excessive wetting, drying or otherwise disturbed by the construction following acceptance for moisture and density should be retested followed by the correction of deficient areas just prior to the installation of additional fill or structures.
- f. In no instance should placement of structural fill or ground supported structures be permitted if the ground surface soils contain a moisture content in excess of 2% of the material’s optimum moisture content.
- g. In no case shall porous drainage backfill (except as specifically indicated at foundation drains only) or masonry sand material be used adjacent to foundations. Care shall be taken to prevent masonry brick/block debris from falling or being pushed into foundation excavations.

### 3.13 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
  - 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10-foot above-or-below required subgrade elevations.
  - 2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10-foot above-or-below required subgrade elevation.
  - 3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation.

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4. Connection of Existing and New Work: Provide flush transition, unless specifically indicated otherwise.
- C. Grading Surface of Fill under Building Slabs and “Building Control Areas”: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.
  - D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### **3.14 BUILDING SLAB DRAINAGE COURSE**

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs, sidewalks, pads, and below canopies and covered porches, and elsewhere as indicated.
  1. **Minimum Completed Thickness: 4-inches.**
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
  1. When a compacted drainage course is indicated to be 6-inches thick or less, place material in a single layer. When indicated to be more than 6-inches thick, place material in equal layers, except no single layer more than 6-inches or less than 3-inches in thickness when compacted.

### **3.15 FIELD QUALITY CONTROL**

- A. Quality Control Testing During Construction:
  1. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
  2. Perform field density tests in accordance with ASTM D 698 (sand cone method), or acceptable ASTM methods or nuclear testing method, as applicable.
  3. New Footing Subgrade: All foundation excavations shall be observed by the Project Geotechnical Engineer or his representative to verify required design bearing capacities of the bearing soils.
  4. New Paved Areas, New Building Slab and “Building Control Areas” Subgrade: Perform at least one field density test of subgrade for every 5,000-square feet of fill area for each foot of vertical thickness of fill placed in “controlled areas”, with a minimum of one (1) test per lift.
  5. Foundation Wall Backfill: Perform at least 2-field density tests at locations and elevations as directed.

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6. Trenches: Perform at least one field density test for every 50-linear feet for each 8 inches of vertical thickness of fill placed in utility or similar trenches, which extend through the “controlled areas”.
    - a. Retaining walls, if any, same as for “Trenches”, as indicated above.
  7. A laboratory soil particle size, Atterberg limit, and Proctor moisture density relationship test shall be performed on each different type of fill soil used in the “controlled areas”.
  8. Based on the Project Geotechnical Engineer’s testing reports, inspections, and recommendations, subgrade or fills that are below specified density, additional earthwork, compaction, and/or other operations, and re-testing, shall be performed until specified density is obtained.

### **3.16 EROSION CONTROL**

- A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

### **3.17 MAINTENANCE**

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Repair edges of existing pavements, sidewalks, etc., and other existing and/or new improvements flush with and to match existing materials and thicknesses, subject to acceptance by Owner and Architect.
- D. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- E. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.18 DISPOSAL OF EXCESS AND WASTE MATERIALS**

- A. Removal from Owner’s Property:
  1. Remove excess and waste materials, including unacceptable excavated material, trash, debris, and waste materials, and legally dispose of off Owner’s property.

## **END OF EARTHWORK**

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**SECTION 31 2500**

**EROSION AND SEDIMENTATION CONTROL**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Temporary and permanent erosion control systems.
- B. Slope Protection Systems.

**1.2 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary and Division 1 Specification Sections, apply to this Section.
  - 1. Section 31 1000 - Site Clearing
  - 2. Section 31 2000 - Earthmoving
  - 3. The Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas, March 2014 edition or most recent edition.
  - 4. Erosion and Sediment Control Plan

**1.3 ENVIRONMENTAL REQUIREMENTS**

- A. The Contractor shall protect adjacent properties and water resources from erosion and sediment damage throughout the life of the contract.
  - 1. The Contractor shall be responsible for the removal of sediments and debris escaping the project site, the remediation and/or repair of any damage that may occur as a result to adjoining and/or downstream affected properties or offsite structures and any fines or penalties levied against the project by regulatory agencies due to deficiencies of control measures.
- B. The Contractor will designate, by name, a Qualified Credentialed Professional (QCP) or equivalent person responsible for monitoring of all erosion control measures for this project. Specific responsibilities will include:
  - 1. Assuring and certifying the Contractor's construction sequence is in conformance with the specified schedule. In addition, a weekly certification stating compliance, any deviations, and corrective measures shall be filed with the Owners by this person. A copy of the certification form may be obtained from the Alabama Department of Environmental Management (ADEM) or the consulting Engineer who obtained the permit.
  - 2. Inspection of all erosion control measures and drainage inlets within 24-hours after any significant rainfall. A significant rainfall shall be defined as over 3/4 inch of precipitation in any consecutive 24 hour period.

3. Inspect areas for catch of grass. A minimum catch of 75 percent is required prior to warrant removal of erosion control measures.
  4. Obtain the NPDES permit. All fees associated with the correspondence with ADEM and inspections as part of the maintenance of the permit are the responsibility of the contractor.
- C. Other than the land clearing activities required to install the appropriate erosion and sediment control measure in accordance with the erosion and sediment control plans, any down slope erosion and sediment control measures, on-site stream channel protection and upslope diversion of drainage required by site conditions, shall be in place and functional before any clearing or earth moving operations begin and shall be constructed and maintained throughout the construction period.
1. Temporary measures may be removed at the beginning of the workday but shall be replaced at the end of the workday.
- D. The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. Any slope or fill which has been graded shall, within thirteen (13) days of the completion of such grading or the completion of any phase of grading, be planted or otherwise be provided with ground cover, materials, devices, or structures sufficient to retain erosion. The devices, structures, and measures shall remain in place until the graded slope or fill is stabilized.
- E. All hazardous substances used for this project shall be stored in accordance with current Spill Prevention Control and Countermeasures (SPCC) regulations.
1. Store substances away from storm drains, ditches, and gutters in water-tight containers.
  2. Dispose of substances in accordance with ADEM regulations.
  3. Provide adequate trash containers on-site for the disposal of material waste.
  4. Prevent trash and debris from entering storm drainage system.
- F. All construction materials shall be properly stored, not exposed to rain, and stockpiled. All containers shall be stored closed or under cover. All excess or waste material shall be disposed of properly.
1. Provide a construction waste dumpster or trailer on-site for disposal of construction waste.
  2. Dispose of trash and waste to an acceptable offsite facility every week at a minimum.
  3. Prevent trash and debris from entering storm drainage system.
- G. There shall be no distinctly visible floating scum, oil, or other matter contained in the storm water discharge to a receiving water, must not cause an unnatural color (except dyes or other substances discharged for the purpose of environmental studies and which do not have a harmful effect on the receiving water) or odor in the receiving waters. The

storm water discharge to receiving water must result in no material in concentration sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving water.

1. Ensure all materials are handled appropriately.
  2. No pollutants are allowed to be disposed of on-site or allowed to enter the storm drainage system.
- H. Upon completion of the land disturbing activity and stable vegetation or other permanent controls have been established on all remaining exposed soil, the Contractor shall notify the Owner of this and request a final inspection.
1. The Owner, or his authorized agent, will inspect the site within 5 working days after receipt of notice.
- I. The Contractor shall prevent the tracking of mud and debris onto paved roadways from construction areas.
1. Provide a construction exit pad in accordance with the erosion and sediment control plans and in accordance with the approved installation procedures, and maintain it on a daily basis.
    - a. Provide a spray hose for the washing of tires and equipment
    - b. Rework or supplement the construction exit pad stone as required to ensure its continued effectiveness throughout the duration of the construction period.
  2. Remove any sediments tracked offsite or deposited on the adjacent roadways.
    - a. Utilize a mechanically operated street sweeper to remove any mud and sediment deposited on the adjacent roadways.
- J. The Contractor shall be responsible for keeping dust to a minimum through the use of water trucks or other dust controlling methods throughout the construction duration.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Quick growing grasses for temporary seeding (see seed mixes contained in CBMPP and in Plans).
- B. Fencing for siltation control as specified on the plans.
- C. Temporary mulches such as loose hay, straw, netting, wood cellulose or agricultural silage.

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- D. Fence stakes shall be metal stakes a minimum of 54 inches in length.
  - E. Stone check dams shall be spaced according to the Plans.
  - F. Stone Sediment Barriers or SiltSacks™, or approved equal for inlet protection.
  - G. High Density Poly-Ethylene (HDPE) Filters or Silt-Saver™, or approved equal for inlet protection.
  - H. A stabilized construction entrance shall be constructed temporarily.
  - I. Riprap for slopes, culvert, storm drain inlet, and outlet aprons.
  - J. Water for dust control.
  - K. Wattle check dams shall be spaced according to plans.
  - L. Erosion control blankets and/or turf reinforcement mats to protect seed and prevent erosion on slopes.

### **PART 3 – EXECUTION**

#### **3.1 PREPARATION**

- A. Review site erosion and sediment control plan attached to this section of the specifications.
- B. Deficiencies or changes in the erosion control plan as it is applied to current conditions will be brought to the attention of the Engineer for remedial action.

#### **3.2 IMPLEMENTATION**

- A. Provide catalog cuts and information concerning the erosion control products which will be used for construction for review by the Engineer.
- B. Provide information concerning the installation of the erosion and sedimentation control including anchorage trench provisions and anchorage devices and spacing for review by the Engineer.
- C. Provide construction exit pad in accordance with the erosion and sediment control plan and in accordance with the approved installation procedures.
- D. Place erosion control systems in accordance with the erosion and sediment control plan and in accordance with approved installation procedures.
- E. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations. The Owner has the authority to direct the Contractor to provide immediate permanent or temporary pollution control measures. The Contractor will be required to incorporate all permanent

erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical.

- F. The temporary erosion control systems installed by the Contractor shall be maintained as directed by the Engineer to control siltation at all times during the life of the Contract. The Contractor must respond to any maintenance or additional work ordered by the Engineer within a 48 hour period.
- G. Slopes that erode easily shall be temporarily seeded as the work progresses according to the ALDOT seeding schedule or according to the seeding schedule contained in the plans.
- H. Remove and properly dispose of accumulated silt and sediment from all erosion control measures on a daily basis off site unless material is reusable.
- I. Remove and properly dispose of all trash and sediments accumulated in existing and new storm drainage inlets, structures, and pipes on a daily basis off site unless material is reusable.
- J. Provide temporary diversion berms and ditches as required during construction to protect work areas from up-slope runoff and/or to divert sediment-laden water to appropriate sediment control devices, traps, or stabilized outlets.
- K. Provide water trucks or other adequate method for controlling dust throughout the construction period.

**END OF SECTION**

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**SECTION 31 3116  
TERMITE CONTROL**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Chemical soil treatment.

**1.02 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - 1. Section 03 3100 - Concrete.
  - 2. Section 31 2000 - Earth Moving.

**1.03 DESCRIPTION OF WORK**

- A. Work described in this section includes soil treatment for termite control, for use and application below any new on-grade interior floor slabs, and also where any existing slabs may be opened or removed for any new, repair, replacement, or other subgrade work at interior of building and/or within interior perimeter exterior walls.

**1.04 REFERENCE STANDARDS**

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2019.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
  - 1. Include the EPA-Registered Label for termiticide products
- C. Manufacturer's Instructions: Indicate caution requirement.
- D. Qualification Data: For Installer of termite control products.
- E. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:
  - 1. Date and time of application.
  - 2. Moisture content of soil before application.
  - 3. Brand name and manufacturer of termiticide.
  - 4. Quantity of undiluted termiticide used.
  - 5. Dilutions, methods, volumes, and rates of application used.
  - 6. Areas of application.
  - 7. Water source for application.
- F. Submit completed forms for required warranties, guarantees, and bonds for acceptance, prior to beginning work.
- G. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

**1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing this type of work and:
  - 1. Having minimum of three (3) years documented experience.

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2. Licensed in accordance with regulations of governing authorities for application of soil treatment solution in the State in which the Project is located.
  - B. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.
  - C. Source Limitations: Obtain termite control products through one source and from a single manufacturer for each product.
  - D. Use only termiticides which bear a Federal registration number of the U.S. Environmental Protection Agency.
    1. Formulate and apply termiticides according to the EPA-Registered Label.
  - E. Mix treatment solution on site, in presence of Contractor's Superintendent, using clean potable water and new termiticide delivered to site in undamaged, original, unopened, and factory-sealed containers.

**107 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for requirements for application, application licensing, and authority to use toxicant chemicals, and comply with EPA regulations.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants where required.

**108 SEQUENCING**

- A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

**109 JOB CONDITIONS**

- A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.
- B. Environmental Limitations: To insure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

**110 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
  - B. Provide five year installer's warranty against damage to building caused by termites.
    1. Provide paid-up and bonded guarantee for a period of five (5) years from date of treatment, signed by the Applicator and Contractor. Paid-up guarantee shall include annual inspection during the five (5) years and an agreement to renew the bond annually after the five (5) years is up, on payment by the Owner of an annual fee.
    2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.
    3. A specimen of the form of guarantee and the bond shall be submitted for approval before the work begins.
  - C. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (*Coptotermes formosanus*). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
    1. Warranty Period: Five years from date of Substantial Completion.
  - D. Wood Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied wood termiticide treatment
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will prevent infestation of subterranean termites, including Formosan termites (*Coptotermes formosanus*). If subterranean termite damage is discovered during warranty period, repair or replace damage caused by termite infestation and treat replacement wood.

1. Warranty Period: 12 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **201 CHEMICAL SOIL TREATMENT**

- A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.
- B. Manufacturers/Products: Subject to compliance with requirements, provide one of the following termiticide products:
  1. Aventis Environmental Science USA LP; Product "Termidor".
  2. Bayer Environmental Science Corp; Product "Premise 75, Premise Pre-Construction, or Premise Pro": [www.nobugs.com](http://www.nobugs.com).
  3. Nisus; Product "Bora-Care": [www.nisuscorp.com](http://www.nisuscorp.com).
  4. Syngenta Professional Products: [www.syngentaprofessionalproducts.com](http://www.syngentaprofessionalproducts.com).
- C. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
- D. Diluent: Recommended by toxicant manufacturer.
  1. Fuel oil will not be permitted as a diluent.

## **PART 3 - EXECUTION**

### **301 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.
- C. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
  1. Proceed with application only after unsatisfactory conditions have been corrected.

### **302 PREPARATION:**

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
  1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.



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**303 APPLICATION - CHEMICAL TREATMENT**

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
  - 1. Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.
- B. Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
- C. Spray apply toxicant in accordance with manufacturer's instructions.
- D. Apply toxicant at following locations:
  - 1. Under Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment.
    - a. Under slab-on-grade structures, treat soil before concrete footings and slabs are placed, using the following rates of application (unless manufacturer recommends otherwise):
      - 1) Apply four (4) gallons of chemical solution per ten (10) linear feet to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.
      - 2) Apply one (1) gallon of chemical solution per ten (10) square feet as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.
      - 3) Apply four (4) gallons of chemical solution per ten (10) linear feet of trench, for each foot of depth from grade to footing, along outside edge of building. Dig a trench six (6) inches to eight (8) inches wide along outside of foundation to a depth of not less than twelve (12) inches. Punch holes to top of footing on not more than twelve (12) inches on center and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench
  - 2. In Crawl Spaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
    - a. In crawl-space and basement structures, treat soil along exterior and interior walls of foundations with shallow footings as specified above for exterior of slab-on-grade structures. Treat soil under or around crawl-space structures using the following rates of application (unless manufacturer recommends otherwise):
      - 1) Apply four (4) gallons of chemical solution per ten (10) linear feet of trench along inside of foundation walls, along both sides of interior partitions, and around piers and plumbing. Do not apply an overall treatment in crawl spaces.
      - 2) Apply four (4) gallons of chemical solution per ten (10) linear feet of trench, for each foot of depth from grade to footing, along outside of foundation walls.
      - 3) Apply one (1) gallon per ten (10) square feet of soil surface as an overall treatment, where attached concrete structures are on fill or ground.
  - 3. Foundations: At Both Sides of Foundation Surface: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from

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- grade to bottom of footing. Avoid soil washout around footings.
  - 4. At hollow masonry foundations or grade beams:
    - a. Treat voids at rate of two (2) gallons per ten (10) linear feet (unless manufacturer recommends otherwise), poured directly into the hollow spaces.
  - 5. Masonry: Treat voids.
  - 6. At expansion joints, control joints, and areas where slabs will be penetrated:
    - a. Apply at rate of four (4) gallons per ten (10) linear feet of penetration (unless manufacturer recommends otherwise).
  - 7. Soil Within 10 feet of Building Perimeter For a Depth of 1 foot .
  - E. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
  - F. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
  - G. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
  - H. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
  - I. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
  - J. Re-treat disturbed treated soil with same toxicant as original treatment.
    - 1. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.
  - K. If inspection or testing identifies the presence of termites, re-treat soil and re-test.
  - L. Post signs in areas of application warning workers that soil termiticide treatment has been applied. Remove signs when areas are covered by other construction.

**3.04 PROTECTION**

- A. Do not permit soil grading over treated work.

**END OF SECTION**

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**SECTION 32 1216**

**ASPHALT PAVING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.
- B. Related work described elsewhere includes:
  - .. Section 31 2000 - "Earth Moving"
  - .. Section 32 1313 - "Concrete Paving"
  - .. Section 32 1613 - "Curbs and Gutters"

**1.2 DESCRIPTION OF WORK**

- A. Work described in this section includes new bituminous paving, a new base, and otherwise as indicated on drawings.
- B. Work shall also include pavement patching for any utility trenches under existing paving and this Contract, with prepared subgrade, 8" crushed aggregate base, 6 inch thick 3,000 psi concrete, prime coat, and 1-1/2 inches bituminous concrete overlay, and as indicated on the Drawings.
  - 1. Pavement patch shall extend 9" to 1'-0" beyond each side or edge of trench, and to abut flush with edge where existing paving was cut out.

**1.3 QUALITY CONTROL**

- A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of bituminous materials and other manufactured items, certifying that these products comply with specifications and standards listed hereinafter.
  - 1. All asphalt used for pavement shall be produced by a plant certified by the Alabama Department of Transportation (ALDOT).
- B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the "Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction", latest edition.
- C. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by an independent testing laboratory. Refer to Section 01 0150 - "Special Conditions," for additional information.

#### **1.4 JOB CONDITIONS**

- A. Any base or sub-base areas damaged by weather or construction operations shall be scarified, remixed and recompactd in accordance with requirements before application of the prime coat.
- B. Special care and attention shall be given to be certain that paving operations and/or equipment do not cause damage to any existing and/or new buildings, structures, or improvements which are to remain.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Provide the paving system(s) indicated on the Drawings, installed in accordance with Part 3 of this Section, and referenced standards.

### **PART 3 - EXECUTION**

#### **3.1 PRIME COAT**

- A. Application rates and construction requirements shall be as specified in ALDOT Section 401, Bituminous Surface Treatments, for a Bituminous Treatment Type "A" which is a prime coat.

#### **3.2 TACK COAT**

- A. Construction requirements, including preparation of the existing surface or substrate and maximum application rates, are specified in ALDOT Article 405.03.

#### **3.3 PLANT MIX BITUMINOUS CONCRETE BINDER LAYER AND BITUMINOUS CONCRETE WEARING SURFACE**

- A. Construction requirements, including finished surface tolerance, density requirements, and maintenance and protection shall be as specified in ALDOT Articles 410.03 through 410.07, 327.03 and 424.04, as applicable. Rate of application shall be not less than the number of pounds per square yard for a 1-inch wearing surface or pavement patching layer, pro-rated for other thicknesses, as required by referenced ALDOT Specifications.

#### **3.4 CRUSHED AGGREGATE BASE**

- A. Construction requirements shall comply with the ALDOT Specifications for the materials indicated, including in part, applicable portions of Section 825, Type B and ALDOT Section 301; compacted in accordance with the recommendations made in the geotechnical investigation.

### **3.5 COMPACTION EQUIPMENT**

- A. Compaction equipment shall be self-propelled, capable of compacting the mixture throughout the depth of the layer while it is still in a workable condition without damage to the material.
  - 1. Self-propelled rollers shall have a minimum weight of 10 tons.

### **3.6 PAVEMENT PATCH**

- A. Saw cut perimeter of existing paving to a neat straight line where removal is indicated and/or required.
  - 1. Protect edges of paving and base exposed to prevent cracking, breaking-up, wash-out, erosion, and/or other damage; apply prime coat as specified and at all such vertical edges prior to placing new pavement.
- B. Patch pavement with components stated in Paragraph 1.2-B above, in compliance with each component's specified requirements, and as per details and sections on Drawings, if any.

**END OF ASPHALT PAVING**

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**SECTION 32 1313**

**CONCRETE PAVING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - .. Section 31 2000 - "Earth Moving"
  - .. Section 03 3100 - "Concrete"
  - .. Section 07 9000 - "Joint Sealers"

**1.2 DESCRIPTION OF WORK:**

- A. Extent of portland cement concrete paving is shown on drawings, including exterior walks, paving, entry pads, dumpster pads, and mechanical equipment pads.

**1.3 QUALITY ASSURANCE:**

- A. Codes and Standards: Comply with "Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction," latest edition, and local governing regulations if more stringent than herein specified.
- B. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by a qualified independent testing laboratory. Refer to Section 01 0150 - "Special Conditions", for additional information and requirements.

**PART 2 - PRODUCTS**

**2.1 MATERIALS:**

- A. Forms:
  - 1. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
  - 2. Use flexible spring steel forms or laminated boards to form radius bends as required.
  - 3. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh:



1. Welded plain cold-drawn steel wire fabric, ASTM A 185.
    - a. Size: 6" x 6" #6, unless indicated otherwise.
  2. Furnish in flat sheets, not rolls, unless otherwise acceptable to Engineer, for all concrete paving subject to possibility of bearing the weight of vehicular traffic.
  3. Furnish in rolls for all concrete paving accessible only to pedestrian traffic, unless indicated otherwise on structural drawings.
  4. Locations for Use: All concrete pads and paving, at 1/3 of total depth of concrete from top of slab.
- C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40 or 60.
- D. Concrete Materials: Comply with requirements of Section 03 3100 - "Concrete", for concrete materials, admixtures, bonding materials, and other materials as required.
- E. Expansion Joint Materials: Comply with requirements of Section 07 9000 - "Joint Sealers" for preformed and pourable expansion joint fillers and sealers.
- F. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

## 2.2 CONCRETE MIX, DESIGN AND TESTING:

- A. Comply with requirements of Section 03 3100 - "Concrete", for concrete mix design, sampling and testing, and quality control, and as herein specified.
- B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:
1. Sidewalks, curbs and gutters, entry pads, and mechanical equipment pads subject only to pedestrian traffic:
    - a. Compressive Strength: 3,000 psi, minimum at 28 days.
    - b. Maximum Slump: 4".
    - c. Air Content: 4% to 6%
    - d. Thickness: 4", unless indicated otherwise.
    - e. Compacted Subgrade: 4" crushed aggregate base on compacted subgrade (98% S.P.D.).
  2. Paving and pads subject to vehicular traffic, valley gutters, dumpster pads, and where indicated:
    - a. Compressive Strength: 4,000 psi, minimum at 28 days (minimum 650 psi flexural strength) in accordance with ALDOT Section 450 - "Portland Cement Concrete Pavement", of the Alabama Department of

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Transportation, Standard Specifications for Highway Construction, most current edition.

- b. Slump: Less than 4".
- c. Air Content: 4-6%
- d. Thickness: 6", unless greater thickness is indicated on the Drawings.
- e. Subgrade: Unless otherwise indicated on the Drawings, 6" dense graded aggregate base, ALDOT Section 825, Type B (98% M.P.D.), installed in accordance with construction requirements for the materials indicated, including in part, applicable portions of Section 825 and Section 301.

### **PART 3 - EXECUTION**

#### **3.1 SURFACE PREPARATION:**

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- C. Subgrade shall be approved by the Owner's Geotechnical Engineer before paving begins.

#### **3.2 FORM CONSTRUCTION:**

- A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork for grade and alignment to following tolerances:
  - 1. Top of forms not more than 1/8" in 10'.
  - 2. Vertical face on longitudinal axis, not more than 1/4" in 10'.
- C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

#### **3.3 REINFORCEMENT:**

- A. Locate, place and support reinforcement as specified in Section 03 3100 – “Concrete”, unless otherwise indicated. Install welded wire fabric in as long lengths as practicable, lapping at least on mesh.

#### **3.4 CONCRETE PLACEMENT:**

- A. Comply with requirements of Section 03 3100 - “Concrete”, for mixing and placing concrete, and as herein specified.

- B. Do not place concrete until subbase and forms have been checked for line and grade. Moistened subbase, if required, to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with core to prevent dislocation of reinforcing, dowels, and joint devices.
  - 1. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

### 3.5 JOINTS:

- A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
- B. Weakened-Plane (Contraction) Joints:
  - 1. Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows below.
  - 2. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
  - 3. Sidewalks shall be scored at 5-foot intervals unless otherwise indicated.
- C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.
- D. Expansion Joints:
  - 1. Provide expansion joints with premolded joint filler at locations abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
  - 2. Extend joint fillers full-width and depth of joint.
  - 3. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

4. Expansion joints for sidewalks shall be placed at 30-foot maximum intervals and along all intersections with other walks, steps, curbs, or other vertical surfaces.
- E. Fillers and Sealants: Comply with the requirements of Section 07 9000 - "Joint Sealers", for preparation of joints, materials, installation and performance.

### 3.6 CONCRETE FINISHING:

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Using hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
- C. Work edges of slabs and formed joints with an edging tool, and round to 1/4" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.
- D. After completion of floating and troweling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
  1. Light and smooth broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation as required to provide a fine line texture acceptable to Architect.
- E. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.
- F. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.
  1. Provide rubbed finish for exposed edges of concrete work, and apply light and smooth broom finish.

### 3.7 CURING:

- A. Protect and cure finished concrete paving, complying with applicable requirements of Section 03 3100 - "Concrete". Use curing and sealing compound or approved moist-curing methods.
- B. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

**3.8 REPAIRS AND PROTECTIONS:**

- A. Repair or replace broken or defective concrete, as directed by Architect.
- B. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy resign grout.
- C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
  - 1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

**END OF CONCRETE PAVING**

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**SECTION 32 1613**

**CURBS AND GUTTERS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.
- B. Related work specified elsewhere includes:
  - .. Section 31 2000 - "Earth Moving"
  - .. Section 32 1313 - "Concrete Paving"
  - .. Section 03 3100 - "Concrete"
  - .. Section 07 9000 - "Joint Sealers"

**1.2 DESCRIPTION OF WORK**

- A. Work described in this section includes the construction of new concrete curbs and gutters, and/or straight curbs where indicated, and patching between any existing paving and new curb and gutters, sidewalks, etc., to match existing pavement.
- B. Refer to Drawings and Owner's Subsurface Investigation Report, for additional information and base requirements.
- C. Refer to Section 31 2000 - "Earth Moving" for subgrade requirements below and beyond curbs and gutters.
- D. Refer to Section 32 1313 - "Concrete Paving", for valley gutters, turn-outs, and paving.

**1.3 QUALITY CONTROL**

- A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of ready-mix concrete, reinforcing steel, curing material, joint fillers, and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.
- B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, latest edition.
- C. Testing: All laboratory and field testing as required to ensure compliance with these specifications shall be performed by a qualified independent testing laboratory. Refer to Section 01 0150 - "Special Conditions", for additional information.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Concrete shall be Class “A”, Type 4 (3,000 psi), in accordance with Section 501, “Structural Portland Cement Concrete”, of the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, latest edition. A modified mix shall be used if optional machine laid curb and gutter is constructed.
- B. Reinforcing steel, where called for on the drawings, shall meet the requirements of Section 502, “Steel Reinforcement”.
- C. Curing material shall be either burlap cloth, waterproof paper, polyethylene sheeting, or impervious membrane specified in ALDOT Articles 830.01 and 830.02.
- D. Joint filler and sealer for expansion and construction joints shall meet the appropriate requirements of ALDOT Section 832, and Section 07900 - “Joint Sealers” herein.
- E. Asphalt for repairs shall comply with referenced ALDOT Specifications, and city requirements, and shall match existing pavement at location(s) requiring patching.

### **PART 3 - EXECUTION**

#### **3.1 CURBS AND GUTTERS**

- A. Comply with requirements of Section 32 1313 - “Concrete Paving,” Section 03 3100 - “Concrete,” and the following:
  - 1. Construction requirements, including foundation, forms, sections, joints, placing and finishing concrete, curing and protection, and backfilling shall be as specified in Article 623.03. Curbs and gutters shall match the profile of existing adjoining curb and gutter, if any, and otherwise as detailed.
  - 2. Curb and gutter shall be constructed in sections having a maximum length of 10-feet. Transverse expansion joints with filler and joint sealer shall be installed at all curb returns and in curb and gutter at intervals not exceeding 40-feet. Similar joints shall be installed behind the curb where sidewalks adjoin the curb and gutter, and at all fixed objects which adjoin or extend through the curb and gutter.
  - 3. Care shall be exercised that “tilt-out” curb and gutter is installed where pavement slopes away from the curb, and that 10-foot long transition sections are used where required to transition between “standard” and “tilt-out” curb and gutter.

#### **3.2 REPAIRS AND PROTECTIONS**

- A. Repair or replace broken or defective concrete, as directed by Architect.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14-days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
  - 1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

### **END OF CURBS AND GUTTERS**



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**SECTION 32 1723**

**PAVEMENT MARKING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Work described in this section includes marking of graphic symbols, lane separations, parking stripes, and lettering on concrete and asphalt pavements, if any, at locations indicated and as shown on the Drawings.
- B. Related work specified elsewhere includes:
  - .. Section 32 1216 - "Asphalt Paving"
  - .. Section 32 1313 - "Concrete Paving"

**1.2 QUALITY CONTROL**

- A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of materials, certifying that these products comply with specifications and standards listed hereinafter.
- B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, most current edition.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Paint for pavement marking shall be, traffic marking paint complying with Section 856, of the ALDOT specifications, and as follows:
  - 1. Class 1, Type A (reflective) in public Right-of-Ways.
  - 2. Class 1, Type B (non-reflective) within property lines of this project's site, 2 coats.

**PART 3 - EXECUTION**

**3.1 PAVEMENT MARKING:**

- A. Each individual painted parking stripe shall be 4-inches wide, and shall be laid out as indicated on the drawings. Construction requirements shall conform to the applicable parts of Article 701.03 of the ALDOT Specifications for Class 1, Type as specified, traffic stripe.
  - 1. Color shall be white for asphalt, yellow for concrete pavement, and international blue for striping and graphics for parking spaces for people with disabilities.

2. Use same materials and construction methods for any arrows and symbols indicated on paved areas.
3. Mark paving at each space for the people with disabilities with acceptable international graphics symbol, unless otherwise indicated, approximately 4' x 4' in size. Locate centered in space width and approximately 2'-0" from end of space where vehicle enters.

**END OF PAVEMENT MARKING**

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10 September 2024

**LANDSCAPE ARCHITECTURE SECTIONS:**

- 32 8400 – IRRIGATION WORK
- 32 9000 – PLANTING (LANDSCAPE WORK)
- 32 9100 – PLANTING PREPARATION
- 32 9200 – TURFS AND GRASSES
- 32 9219 – SEEDING AND RESTORATION

**SECTION 32 8400  
IRRIGATION WORK**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS:**

- A. The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.
- B. Section 32 9000 - "Landscape Work"

**1.02 DESCRIPTION OF WORK:**

- A. Furnish all labor, materials, equipment and services necessary for the complete installation of the landscape irrigation system as drawn and specified. The irrigation system for Phase will be independent from Phase 1. The work includes, but is not limited to:
  - 1. Trench, backfill and compaction for irrigation lines
  - 2. Automatically controlled landscape irrigation system; backflow preventer; booster pump; alternate submersible pump and wet well; alternate filter; master valve; isolation gate valves; piping and sleeves under paving; repair of paving, main and lateral lines; electrical valves and wiring; valve boxes and controllers; sprinklers; couplings; connectors; fittings; and if needed, tape and meter.
  - 3. Test all systems and make operative.
  - 4. Submit Record Drawings and Maintenance Manual.
  - 5. One-year Guarantee Period.
  - 6. Maintain and operate for 1-year beyond Date of completion of Substantial Completion punch list.

**1.03 QUALITY CONTROL:**

- A. Installer Qualifications: Firm shall hold Alabama General Contractors License for Specialty Construction, Subclassification - Landscaping or Other Specialty Construction (specified as Irrigation). Firm experienced in the successful installation of a minimum of five (5) projects within the past five (5) years similar in scope, quality, and contract value to that indicated for this project. Firm shall have sufficient manpower, equipment and financial resources to complete the Work of this Section.
- B. The Owner and the Landscape Architect reserve the right to reject any and all materials and workmanship, which they deem to be not in accordance with Drawings and Specifications. Rejected

materials and work shall be removed from site immediately and replaced with that of the specified quality.

C. Applicable Standards:

1. ASTM:

- a. D1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40.
- b. D2464: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Threaded, Schedule 40.
- c. D2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
- d. D2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

D. Applicable Codes:

1. Most current edition of Uniform Plumbing Code.
2. Applicable Building Code.
3. All applicable local codes and ordinances.
4. National Electrical Code.
5. Should Specification's requirements differ from local requirements, consider Contract Document requirements to be the minimum acceptable and comply with any more stringent local requirements.

E. Permits and Fees:

1. Obtain all permits and pay required fees to any agency having jurisdiction over the work.
2. Arrange inspections required by local ordinances during the course of construction.
3. Upon completion of the work, furnish satisfactory evidence to show that all work has been installed in accordance with the ordinances and code requirements.

F. Testing:

1. Perform testing and inspections required by specifications and by regulating authorities.
2. Give 24-hours notice that such tests are to be conducted.

**1.04 SUBMITTALS:**

- A. Qualification data for firms specified in "Quality Control" article to demonstrate their capabilities and experience. Include a list of a minimum of 5-similar projects completed within the last 5-years with project name, address, names of Architects and Owners, overall description of scope of work and contract value.
  
- B. Shop Drawings:
  - 1. Submit with Shop Drawings manufacturer's catalog sheet showing full specifications of each type sprinkler proposed including discharge of GPM, minimum allowable operating pressure at sprinkler, maximum allowable spacing and distance of throw (coverage).
  
- C. Record Drawings:
  - 1. Prepare and submit a reproducible Record Drawing showing deviations from the Contract Documents made during construction affecting the main line pipe, controller location, valve locations, and all sprinkler head locations. Record Drawings shall also indicate and show approved substitutions of size, material, and manufacturer's name and catalog number and name.
  - 2. Deliver Record Drawings with request for inspection and acceptance.
  - 3. Deliver one (1) set of record drawings, reduced in size and laminated. Drawings should be suitable for mounting adjacent to irrigation controller.
  
- D. Maintenance Manual:
  - 1. Prepare and submit irrigation system maintenance and operating instructions, with relevant manufacturer's literature. Include complete parts list covering all operating equipment.
  - 2. Submit in a hardcover, 3-ring binder.
  - 3. Include full name, address, and telephone number of Installer.

**1.05 COORDINATION:**

- A. Coordinate and cooperate with the Architect and other contractors and trades to enable the work to proceed as rapidly and efficiently as possible, and to be completed on schedule.
  
  - B. Anticipate last minute delays, which may necessitate overtime work to complete the work on schedule. Sleeves under paving shall be placed by Site Contractor. Coordinate with other trades on site for sequencing of work.
-



**1.06 SITE INSPECTION:**

- A. Become familiar with all site conditions.
- B. Should utilities not shown on plans be found during excavations, promptly notify the Architect for instructions as to further action.
- C. Make necessary adjustments in the layout as may be required:
  - 1. To connect to existing stubouts (should such stubs not be located exactly as shown); or
  - 2. To work around existing work. Such adjustments shall be made with no increase in cost to the Owner.
  - 3. To avoid existing utilities.

**1.07 PROTECTION OF EXISTING CONDITIONS:**

- A. Take necessary precautions to protect site conditions to remain.
- B. Should damage be incurred, repair the work to its original condition at no additional cost to the Owner.

**PART 2 - PRODUCTS**

**2.01 PVC PIPE - (POLYVINYL CHLORIDE PIPE):**

- A. PVC pipe shall be manufactured in accordance with standards noted herein.
  - B. Marking and Identification: PVC pipe shall be continuously and permanently marked with the following information:
    - 1. Manufacturer's name, pipe, size, type of pipe and material, SDR number, ASTM standard number and NSF (National Sanitation Foundation) seal
  - C. Irrigation Water Piping:
    - 1. Main Lines: ASTM D-1785, Schedule 40.
    - 2. Lateral Lines: ASTM D-1785, Class 200.
  - D. This Contractor is responsible for determining if sleeves were installed prior to submitting a bid. If not installed, boring under paving, and/or hand excavation is required.
-

**2.02 PIPE FITTINGS:**

- A. PVC: Meeting specified standards, Schedule 40, Standard Weight, at PVC pipe; joints solvent welded as recommended by manufacturer, except swing joints and riser to head, which shall be threaded with Teflon Tape. Swing joints shall be Schedule 80.

**2.03 SOLVENT CEMENT:**

- A. Meeting ASTM D-2564 and of proper consistency.

**2.04 RISERS:**

- A. Spray Heads in all areas use swing pipe. Submit sample of swing joint for approval.
- B. Rotor heads use triple elbow swing joint, submit sample of swing joint for approval.

**2.05 DRIP IRRIGATION**

- A. OMIT
- C. OMIT
- D. OMIT
- E. OMIT

**2.06 VALVES:**

- F. Electric Remote-Control valve sized as per manufacturer's recommendations, mechanical joint.

**2.07 OMIT**

**2.08 OMIT**

**2.09 OMIT**

**2.10 BACKFILL UNDER PAVING:**

- G. Crushed stone of the following gradation, placed and compacted to 100%:  
100% passing ½-inch sieve.
-

90-100% passing 3/8-inch sieve.

60-85% passing #4 sieve.

40-70% passing #8 sieve.

10-25% passing #50 sieve.

1-5% passing #200 sieve.

**211 VALVE BOX AND COVER:**

H. Ametek or approved equal with provision for locking.

**212 AUTOMATIC CONTROLLER:**

I. Controller is RAIN BIRD ESP-2WIRE

**213 CONNECTION TO WATER MAIN:**

J. Install backflow preventer as per City recommendations.

K. If needed, install irrigation water meter and tap as per City recommendations.

L. Contractor to check pressure at water meter and verify if sufficient pressure is available for the irrigation system.

**M. OMIT**

**PART 3 - EXECUTION**

**3.01 GENERAL:**

A. Verify existing and proposed locations of all site utilities (i.e. gas, water, electric, telephone) prior to any trenching and laying of pipe.

B. Coordinate all irrigation work with that of all other site work trades and contractors.

C. All piping to be installed directly behind curb where possible and in all cases to be routed around existing or proposed site elements, including root balls of proposed trees and shrubs. Refer to the landscape planting Drawings for approximate tree locations and closely coordinate work and schedule with grading and planting work.

- D. Contractor is responsible for full and complete coverage of all areas designated on the Drawings to be irrigated and shall make any necessary adjustments at any time, at no additional cost to the Owner.
- E. Exact location and configuration of islands and other features may vary from that shown on these Drawings. Verify location and configuration at the site prior to trenching for sleeves and piping under paving, and make any minor adjustments to irrigation systems layout. Notify Architect of substantial changes.
- F. Maintain all warning signs, barricades, bracing, flares, and red lanterns as required by safety regulations and local ordinances.

### **3.02 INSTALLATION:**

- A. General:
    - 1. Lay out according to site coordinates and actual field dimensional controls; verify piping and sleeve locations before trenching.
  - B. Excavating and Trenching:
    - 1. Perform all excavation required for installation of the work included under this Section, including shoring and bracing of earth banks to prevent cave-in.
    - 2. Restore all surfaces and existing underground installations damaged or cut as a result of the excavations, to their original condition and in a manner approved by the Owner.
    - 3. All excavation shall be unclassified. Trenches shall be 4-inches wide and to the depth required as specified herein and shown in the Drawings.
    - 4. Over-excavation shall be backfilled at the Contractor's expense with cushion sand. Remove all unsuitable or excess material from the site.
    - 5. Dewater excavations as required for dry work including both surface and ground water.
    - 6. Trenches shall have sides as nearly vertical as possible and bottoms shall be shaped to provide continuous bedding of each section of pipe along its entire length in undisturbed soil or thoroughly compacted fill.
    - 7. Trenches for piping shall be of sufficient depths to provide 12-inches minimum cover for pipes from finished grade. In Public Right-Of-Way, provide 18-inches minimum cover over top of main and lateral lines, or greater depth if required by local authorities.
  - C. Pipe Installation:
    - 1. Pipe installation includes all irrigation piping required for water and electrical wiring to complete the automatic irrigation system.
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2. Provide firm, uniform bearing for entire length of each pipeline to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before joining and keep piping clean by approved means during and after laying of pipe.
3. Assemble pipe and solvent weld. Clean joint thoroughly of dust, dirt, and moisture before applying solvent with non-synthetic bristle brush.
4. Install tracer wire indication on all main lines.
5. Provide Irrigation Sleeve Medallions, two (2) inch aluminum medallion to be placed in pavement/curb where irrigation sleeves are place for sleeve location.
6. Install all pipe and wiring under paving in sleeves as specified, whether or not shown on Drawings. Pressure test all piping under paving prior to paving. All mains and piping under pavement to be pressure tested and activated immediately.

D. Pipe Fitting:

1. Solvent: Use only solvent recommended by manufacturer to make solvent welded joints. Thoroughly clean pipe and fittings of dirt, dust and moisture before applying solvent.
2. PVC to Metal Connection: Work metal connection first. Use a TEFLON pipe fitting tape on threaded PVC to metal joints. Use only light wrench pressure.
3. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.

E. Irrigation Heads:

1. Prior to installation, verify configuration of planting areas and tree locations, and stake head layout accordingly. Obtain approval of staked head locations from Landscape Architect before proceeding.
2. Rotor and Pop-up Spray Heads: Attach sprinkler as specified. Adjust riser height after planting.

F. Wiring:

1. Supply #14 UL listed single strand U.F. direct burial wire from automatic controllers to the valves in accordance with the Specifications. Use PVC conduit for all locations of wire under paving; in landscaped areas, the Contractor may add conduit for wires at his option, in lieu of tucking wire under main lines and lateral lines.
2. Secure all wire-to-wire connections by approved means.
3. All wire from controllers to valves shall be tucked under piping.

4. Test wires prior to backfilling to ensure continuity from valve location to controller location. Any wire not indicating continuity shall be repaired or replaced immediately.

G. Controller:

1. Verify controller location in field with owner and landscape architect.

H. Electrical Valves: Supply and install in accordance with the materials list and the manufacturer's recommendations; set in a level position.

I. Valve Boxes: Set flush with finish grade (adjust as necessary); set over all valves.

J. Drainage: Place a minimum 12-inches depth of crushed stone under each box containing either water meter, pressure regulator, valve or backflow preventer.

**3.03 TESTING:**

A. Conduct test in presence of Architect. Notify Architect 48-hours in advance of testing date and time:

1. Thoroughly flush out all water lines before installing heads and valves.
2. Operational Test: After backfilling and adjusting heads to final positions, show that system meets coverage requirements and controls function properly. Adjust heads to be not more than ½-inches above finish grade.

**3.04 BACKFILL AND COMPACTING:**

A. Do not backfill until pipe systems have been hydrostatic tested and approved.

B. After system is operating and required tests and inspections have been made, backfill excavations and trenches as follows:

1. Backfill Under Paving:
    - a. Backfill for full depth of excavation with the specified crushed stone. Compact in lifts. Backfill shall be free of debris, large clods, roots or other deleterious material.
    - b. Place backfill material evenly in lifts not to exceed 6-inches and compact to 100-percent of maximum density.
    - c. Contractor is responsible for establishing compaction in trenches equal to or exceeding overall compaction of paving base. Leave top of trench ready for asphalt by others.
  2. Backfill in Landscape Areas:
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- a. Backfill trenches with material removed during excavation and compacted to 85-percent except where rock is encountered. In this case lay pipe in a cushion sand bed surrounding the pipe, a minimum of 4-inches deep.
- b. Compact all excavation to prevent settling. Hand rake excavation areas and adjoining areas to leave grade at the previous elevation and in a good or better condition than before installation. Water-floor compaction will not be permitted.
- c. Repair settled areas throughout Guarantee Period, including repair of affected landscape work.

**3.05 FINAL ADJUSTMENT:**

- A. After planting and irrigation installation has been completed, make final adjustment to irrigation system prior to the Architect's final inspection.
- B. The system shall be completely flushed to remove any and all debris from the lines by removing nozzles from all heads on ends of lines and turning on the system.
- C. Check all heads for correct operation, alignment, and direction of throw.
- D. Check each section of spray heads for operating pressure, and balance in relation to all other sections by use of the flow adjustment on top of each valve.
- E. Check nozzles for complete coverage. Prevailing wind or other conditions may indicate the arc or angle of spray should be other than as shown on plan. In this case, revise nozzle degree to provide correct coverage, at the Contractor's expense.
- F. Adjust head and valve heights as necessary. Make any other adjustments determined necessary by the Landscape Architect to provide complete and uninterrupted coverage.

**3.06 CLEAN-UP:**

- A. Keep site clean on a daily basis by removing trash and debris resulting from construction operation.
  - B. Keep all walks, roads, and circulation routes free from debris, materials, and equipment at all items.
  - C. Upon completion of the irrigation work, clean up all work and storage areas by removing trash piles, surplus material, or other material from site.
  - D. Restore pavement, curbs, ground, and any other disturbed surface to its original condition.
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**3.07 MAINTENANCE AND COMPLETION OF THE WORK:**

- A. Complete the irrigation system as specified and operate and maintain same from time of installation until Substantial Completion and for a period of 1-year beyond Substantial Completion.
- B. Instruct Owner's personnel in complete operation and maintenance of irrigation system.

**3.08 SUBSTANTIAL COMPLETION:**

- A. Submit request for inspection for Substantial Completion to the Landscape Architect at least 24-hours prior to anticipated date of inspection and testing (refer to Paragraph 3.3 TESTING, herein).
- B. Submit Record Drawings and Maintenance Manual to the Landscape Architect with request for inspection (refer to Paragraph 1.4 SUBMITTALS, C. and D., herein).
- C. Review the work jointly with the Owner and Landscape Architect for Substantial Completion.
- D. Upon completion of repairs and replacements found necessary at time of review, the Owner and Architect will confirm the date of Substantial Completion of the work.
- E. The date of completion of repairs and replacements found necessary at time of Substantial Completion, will constitute the beginning date of the 1-Year Guarantee.

**3.09 GUARANTEE:**

- A. Guarantee all work, products, equipment, and materials for 1-year, beginning at date of completion of punch list from Substantial Completion.
  - B. During the period of the Guarantee, replace immediately, with no additional compensation, all work not functioning correctly; make adjustments as necessary to maintain complete coverage; make good any other damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to the Owner.
  - C. Repair damage to grade, plants, and other work or property as necessitated due to irrigation defects, repairs, replacement, or adjustment.
  - D. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacement products shall have a similar 1-year guarantee from time of replacement.
  - E. Guarantee applies to all losses with the exception of those due to Acts of God, Vandalism, or Owner neglect, as determined by the Landscape Architect.
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**3.10 FINAL INSPECTION AND ACCEPTANCE:**

- A. At end of Guarantee Period and upon request for inspection, jointly review all guaranteed work for Final Acceptance.
- B. Submit written request for inspection for Final Acceptance to the Landscape Architect at least 2-weeks prior to anticipated date of inspection; include list of work provisionally accepted and list of work replaced during Guarantee Period.
- C. Upon completion by the Contractor of all required repairs and replacements; the Owner and the Landscape Architect will confirm the date of Final Acceptance of the Work.

**END OF IRRIGATION WORK**

**SECTION 32 9000 PLANTING**  
**(LANDSCAPE WORK)**

**SECTION 1 - GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. The general provisions of the Contract, including General and Supplementary and General Requirements apply to the work specified herein.

**1.2 DESCRIPTION:**

- A. Provide all labor, equipment, materials and services necessary to complete the Work of this Section, including:
1. Providing, placing, grading topsoil and/or sand for landscape grading as indicated in the Drawings.
  2. Providing and installing trees, shrubs, ground covers, and solid sod for landscape planting.
  3. Maintenance for thirty days after Substantial Completion.

**1.3 SUBMITTALS:**

- A. Qualification Data for firms specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include a list of a minimum of five (5) similar projects completed with the last five (5) years with project name, address, names of Architects and Owners, overall description of scope of work, and contract value.
- B. Materials Lists:
1. Within ten (10) days of award of Contract, submit a complete list of materials and unit prices demonstrating source, availability, and complete conformance with requirements specified.
  2. Substitutions not permitted unless proof is submitted to the Landscape Architect's satisfaction that the material is unavailable as specified.
- C. Certificates: Deliver all certificates of inspection to the Engineer.
- D. Product Data:
1. Submit manufacturer's product literature, instructions and guaranteed analysis for fertilizer.

**1.4 DEFINITIONS:**

- A. Trees, shrubs, and groundcovers are plant materials listed in Plant Schedule on Drawings.

**1.5 JOB CONDITIONS:**

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- A. Coordinate the Work of this Section with that of other trades.
- B. Examine conditions under which Work is to be performed and notify Landscape Architect and Landscape Architect in writing of unsatisfactory conditions.
- C. Do not perform Work until conditions are satisfactory and acceptable.
- D. Notify utility companies, prior to digging, for locations of underground utilities (electrical power, telephone, cable, water, sewer and gas) and perform Work in a manner which will avoid all possible damage. Hand excavate as required.
- E. Maintain stakes or other location markers and controls set by others until removal is mutually agreed upon by all parties.

**1.6 QUALITY ASSURANCE:**

- A. Codes and Standards:
    - 1. Applicable Sections of Alabama Highway Department (ALDOT) Standard Specifications for Highway Construction, latest Edition as amended.
    - 2. All plant materials to comply with State and Federal laws relating to inspection for disease and insect control.
    - 3. Plant material quality to conform to *American Standard for Nursery Stock*, American Association of Nurserymen, Inc., 1986, ANSI Z-60.1.1
    - 4. Plant Material nomenclature to conform to:
      - a. *Hortus Third*, a Concise Dictionary of Plants Cultivated in the United States and Canada, MacMillan Publishing Company, Inc., New York, 1976 Edition.
      - b. Names not listed in the above standard to comply with those most commonly used in the trade.
      - c. In all cases, botanical names take precedence over common names.
  - B. Installer Qualifications: Firm shall hold Alabama General Contractor's License for Classification S - Specialty Construction, Subclassification 4 - Landscaping. Firm experienced in the successful installation of a minimum of five (5) projects within the past five (5) years similar in scope, quality, and contract value to that indicated for this project. Firm shall have sufficient manpower, equipment and financial resources to complete the Work of this Section.
  - C. Personnel: Use adequate numbers of skilled workmen trained and experienced in the Work and familiar with requirements and methods needed for performance of the Work. At all times during planting operations, have on the site a person knowledgeable in horticultural practices as a superintendent.
  - D. Inspection and Approval:
    - 1. All plant material is subject to inspection and approval in the field or nursery before digging, by the Landscape Architect.
    - 2. All plant materials and other materials are subject to inspection and/or rejection at the
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site before planting or placing, or at any other time.

3. Attach secure, durable, legible waterproof labels, stating correct botanical and common names as specified, to a least one (1) plant, bundle or container of each plant variety.
4. Remove from site plant materials or other materials not complying with specified requirements within 5 days of rejection.
5. Approval is for visual qualities only and does not relieve the Contractor of his obligation to provide materials and workmanship in full compliance with the requirements of the Contract Documents.

**1.7 PRODUCT DELIVERY, STORAGE and HANDLING:**

- A. Deliver packaged materials in manufacturer's original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at the site.
- B. Deliver all non-packaged or non-containerized materials to site in a manner that will prevent loss, damage, deterioration or contamination.
- C. Store all materials in approved locations to prevent loss, damage, deterioration or contamination.
- D. Deliver, storage and handling of all plant materials shall conform to ALDOT Specifications and the following:
  1. Deliver freshly dug plants, which have not been in cold storage or heeled-in.
  2. Do not prune prior to delivery.
  3. Do not bend or bind trees or shrubs in such a manner as to damage bark, break branches or destroy natural shape.
  4. Provide necessary protective covering during transport and delivery.
  5. Deliver plants after preparations for planting have been completed and approved, and plant immediately.

**1.8 SITE MAINTENANCE:**

- A. Keep roads, paving and structures adjacent to maintenance operations clean and free of obstructions, mud and debris at all times.
- B. Do not permit flushing of roads or disposal of dirt or debris into sewers or drainage ditches.
- C. Control dust from maintenance operations.

**SECTION 2 - PRODUCTS**

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**2.1 SOIL MATERIALS:**

- A. Topsoil:
1. This Contractor shall furnish topsoil in sufficient quantity, to complete grading and planting operations as specified.
  2. Characteristics of topsoil to be furnished:
    - a. Fertile, friable, naturally occurring. Free of stones, clay, lumps, hardpan, roots, stumps, branches, sticks and other debris larger than two (2) inches in any dimension; free of noxious weeds, grasses, seeds, plants, extraneous matter and any substance harmful to plant growth. Topsoil from open fields will not be accepted.
    - b. Ph: 5.0 to 7.0
    - c. Organic Matter: 5% to 10%
    - d. Sand: 50% to 70%
    - e. Silt: less than 30%
    - f. Clay: 10% to 25%
    - g. Permeability Rate of  $5 \times 10^{-3}$  centimeters or greater at 85% compaction.
- B. Notify Engineer of location of proposed topsoil for his inspection before testing or transporting to site.
- C. Topsoil testing for furnished topsoil: Sample and test, minimum of three (3) samples, for compliance with specified characteristics. Tests to be performed by soil testing lab approved in advance by Engineer, by this Contractor at his expense. Submit Soil Test Reports to Landscape Architect for approval before transporting topsoil. Amend per recommendations of Soil Test Report and as approved to meet specified characteristics.

**2.2 SOIL AMENDMENTS:**

- A. Fertilizer:
1. Characteristics:
    - a. Uniform in composition.
    - b. Dry and free-flowing.
    - c. Commercially available.
    - d. Conforming to the State of Federal Fertilizer Laws.
  2. Of the formulation recommended in the Soil Test Report as specified.
- B. Lime:
1. Ground or crushed agricultural lime.
  2. Containing not less than 85% of total carbonates.
  3. 90% passing 20-mesh screen.
  4. Not less than 50% passing a 60-mesh screen.
  5. Dry and free-flowing.
  6. Apply at rate specified in Soil Test Report.

**2.3 LANDSCAPE PLANTING MATERIALS:**

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- A. Water:
  - 1. Provide fresh water, free of impurities or any substance harmful to plant growth.
  - 2. Provide all hose, attachments, and accessories necessary to complete the Work as specified.
- B. Topsoil: Refer to Paragraph 2.1.A, this Section, for specified topsoil for use in all planting operations.
- C. Topsoil Mix:
  - 1. Prepare all topsoil mix used in tree and shrub pits and ground cover beds in the following proportions:
    - a. 2 parts by volume topsoil as specified. 2.1.A.
    - b. 1 parts by volume decomposed organic matter, 2.3.E.
  - 2. Add three (3) pounds of 12-6-6 fertilizer to each cubic yard of topsoil mix during the mixing process, for all plants.
- D. Decomposed Organic Matter:
  - 1. Well rotted organic matter.
  - 2. Containing no weeds, grasses or plants, their seeds, or any substance harmful to plant growth.
  - 3. Of uniform composition.
  - 4. Acceptable Materials:
    - a. Mushroom Compost
    - b. Ground pine bark
    - c. Approved equal.
- E. Chemical Weed Control
  - 1. Pre-Emergent (in bed areas):
    - a. Selective pre-emergent with no residual soil activity. Active ingredient: Trifluralin.
    - b. Commercially available.
    - c. Adhere to manufacturer's recommendations for strength, rate, and method of application.
    - d. Acceptable Manufacturers:
      - 1) Elanco: Treflan
      - 2) Approved substitution.
    - e. Herbicide:
    - f. Non-selective post-emergent with no residual soil activity. Active ingredient: Isopropylamine salt of Glyphosate.
    - g. Commercially available.
    - h. Adhere to manufacturer's recommendations for strength, rate and method of application.

i. Acceptable Manufacturers:

- 1) Monsanto Agricultural Products Company: Round Up.
- 2) Approved substitution.

F. Mulch:

1. Pine straw on slopes: Free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.
2. Ground Pine bark: Free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.

G. Solid Sod:

1. Obtain solid sod from sources having growing conditions similar to the area to be planted.
2. Sod shall be true to name and type of the species named in the plant Schedule.
3. Sod shall be 100 percent of the type specified and shall contain no other grasses.
4. Sod shall be well cultivated and weed, disease and insect-free, of good texture, and free from extraneous roots, stones and other foreign material. The presence of nutgrass or other weeds shall be cause for rejection and replacement prior to Substantial completion, or during the Guarantee Period.
5. Contractor shall lay sod within 24 hours of harvesting. Contractor shall not lay sod if dormant or if ground is frozen or muddy.

H. Seed (If shown on plans):

1. Use Winter Rye Grass as a temporary grass during the cool months, defined as October to March. Seed is to meet purity standards as outlined in AHD Section 860.01a.
2. Use Cynodon Dactylon (Common Bermuda) for seeding during the warm months, defined as April through September. Seed is to meet purity standard as outlined in the AHD Section 860.01a. Seed at a rate of 50 lbs. per acre.
3. Do not broadcast or drop seed when wind velocity exceeds 10 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
4. Sow seed at a total rate of 1.5 lb/1000 sf (Common Bermuda).
5. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

I. Plant Material:

1. Definition: Trees and shrubs listed in the Plant Schedule in the Drawings.

2. General:
    - a. Species, sizes, manner in which to be planted, and approximate quantities to complete the planting as indicated are included in the Plant Schedule.
    - b. Scientific and common plant names conform to those given in *Hortus Third*, or are those generally accepted in the nursery trade.
  3. Quality:
    - a. Conform to the standards set forth in *American Standard for Nursery Stock*.
    - b. Standard quality and first-class representatives of their species or variety and true to name and type.
    - c. Nursery-grown, unless specified otherwise.
    - d. In compliance with State and Federal laws relating to disease and insect infestation; file certificates with Landscape Architect.
    - e. Having normal, well-developed branches and vigorous root systems, free from defects, decay, disfigurements, sun scaled, bark abrasions, plant diseases, insect pests or eggs, borers and any and all infestations.
  4. Rejection of plants for:
    - a. Lack of compactness or proper proportion;
    - b. Weak, thin growth in rows too close together;
    - c. Cut back from larger stock to meet specified requirements;
    - d. Undersized, dry, cracked or broken balls, or plants that are loose in their balls;
    - e. Root bound within container or ball;
    - f. Lacking proper proportion as to height and spread and specified characteristics or plant material;
  5. Size:
    - a. Sizes and proportions of all plant materials shall equal those recommended by the *American Standard for Nursery Stock* for specified grades.
    - b. Measure plants before pruning, with branches in normal position.
    - c. Equal or exceed measurements specified in Plant Schedule, which are the minimum acceptable; provide 50-percent of plant material maximum size specified.
    - d. Height and spread dimensions: General body mass of plant, not from branch tip to tip.
    - e. Well-proportioned as to height; reject plants which meet specified measurements but do not possess an overall balance.
    - f. Take caliper measurement on trunk six-inches above natural ground level up to and including four-inch caliper size; twelve-inches above natural ground level for larger sizes.
    - g. B&B plants shall have firm natural balls of a diameter and depth not less than that recommended in *American Standard For Nursery Stock*.
    - h. Container-grown plants: Conform to standards set forth in *American Standard For Nursery Stock* for container-grown plants.
  6. Quantity: Furnish plants in sufficient quantity to satisfy the intent of the Drawings and Specifications. Locate in sufficient quantity to that time is not lost if some plants are rejected.
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- J. Guying and Staking Materials:
  - 1. Wood Stakes:
    - a. Pressure-treated Southern Yellow Pine, or other approved wood, 2-inches x 4-inches x length specified in the Drawings, pointed at one end.
    - b. Free from insects and fungi.
  - 2. Wire: Pliable #10 or #12 gauge galvanized steel wire, doubled and twisted.
  - 3. Turnbuckles: As detailed and approved by Landscape Architect.
  - 4. Protective Hose:
    - a. Reinforced fiber-bearing rubber hose.
    - b. Black.
    - c. May be second-hand.
    - d. Not less than 2-inches inside diameter.

### **SECTION 3 - EXECUTION**

#### **3.1 INSTALLATION:**

- A. Planting Season:
  - 1. A period of acceptable weather conditions, during seasons in which satisfactory results can be expected as determined by acceptable practice in the locality and approved by the Landscape Architect.
  - 2. Commence planting operations as soon as portions of the site are available, as approved by the Landscape Architect.
- B. Site Inspection:
  - 1. Examine areas and conditions under which Work is to take place.
  - 2. Inform Landscape Architect in writing, prior to planting, of conditions existing which could be considered detrimental to the successful planting and growth of any plant material, including but not limited to, subsurface drainage conditions, utility locations, subgrade compaction, percolation rate and elevations.
- C. Site Preparation:
  - 1. Topsoil (4" in sod areas and 6" in shrub and groundcover beds) shall be spread by the Contractor and fine graded. Topsoil, regardless of the source, shall meet all requirements of the paragraph above.  
  
Stockpile material that does not meet the requirements may, at the option of the contractor, be improved by screening and the addition of organic matter and chemical admixtures.

Do not place or spread topsoil in an area until subgrade is approved by Landscape Architect and is acceptable to this Contractor.

2. Remove all vegetative growth from topsoil by approved means before commencing with planting operations.
  3. Remove all unwanted vegetative growth from areas designated to receive new planting or sod with chemical herbicide or by other approved means, prior to scarifying and placing topsoil.
  4. Remove extraneous matter measuring 1-2-inch or larger in any dimension from top 4-inches of placed topsoil.
  5. Uniformly grade areas including adjacent transition areas to line and grade shown on Drawings.
  6. Obtain approval of finished grades before proceeding with planting operations; eliminate irregularities and ponding.
  7. Protect stockpiled or spread topsoil from erosion by force of wind, water, or other force; re-establish eroded, rutted or settled grades to proper finished grade.
- D. Plant Location Staking and Excavating Compacted Subgrade Tree Pits:
1. Stake plant locations and areas for approval prior to planting.
  2. Do not dig plant pits prior to obtaining Landscape Architect's approval of plant locations.
  3. Make adjustments in plant locations as directed.
  4. If underground obstructions are encountered in planting areas that would prevent the installation of the plant material, contact the Landscape Architect immediately. Alternate locations may be selected by the D & D at no additional cost to the Owner.
  5. All locations where trees are to be installed shall have the topsoil broken up to an 18" depth and 10' radius (if space allows) with a mini excavator.
- E. Topsoil Mix:
1. Prepare topsoil mix to specification 2.3.C off site, using approved topsoil.
  2. Obtain approval of topsoil mix before delivery to site, and prior to commencing planting operations. Do not mix in place with placed topsoil.
  3. Place topsoil mix as backfill for tree and shrub pits and beds as drawn. Place 2-inches of topsoil mix in all shrub beds unless otherwise indicated on the Drawings.
  4. Protect stockpiled topsoil mix from erosion by force of wind of water, or damaged by traffic.
- F. Planting:
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1. Place plants comprising a planting composition in approved staked locates for approval by Landscape Architect.
  2. Planting pits and beds:
    - a. Drainage:
      - 1) This Contractor is responsible for achieving and maintaining adequate drainage from all planting beds. Use specified drainage system, or other approved means, in all tree pits.
      - 2) 48-hours prior to planting, test each plant pit for adequate drainage.
      - 3) Owner reserves the right to test tree or plant pits at any time, before or after planting, for adequate drainage. Correct immediately any inadequate drainage encountered.
    - b. Pits are generally circular in outline with vertical sides.
    - c. Tree pits: 3-feet greater in diameter than ball or root spread.
    - d. Shrub pits: 1-foot greater in diameter than ball or root spread.
    - e. Excavate to specified dimensions and dispose of excavated material off site.
    - f. Prepare as specified in detail Drawings.
  3. Setting plants:
    - a. Set plants uniformly 2-inches to 4-inches higher than surrounding grade or as necessary to provide adequate positive drainage away from roots. Slope soil gradually from saucer.
    - b. Cut rope, wire or string from top of ball after plant has been set; turn down and bury burlap.
  4. Backfilling plants:
    - a. Backfill to 2/3 full with specified topsoil mix.
    - b. Water thoroughly to eliminate air pockets and settling before filling to grade.
    - c. Form shallow saucer at plant pit edge to hold water.
    - d. Water in thoroughly.
  5. Pre-Emergent application:
    - a. Apply per manufactures instructions.
  6. Staking:
    - a. Inspect tree trunks for injury, improper pruning and insect infestation; take corrective measure.
    - b. Immediately after planting, stake trees as detailed.
  7. Pruning:
    - a. Do not prune plants without approval.
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- b. Prune after plants are in place and *ONLY* at the direction of Landscape Architect.
  - c. Main leaders of trees to remain intact.
  - d. Paint all cuts over 2-inch diameter with approved tree wound dressing.
8. Finished Grading: Handgrade and rake planting areas so that grades conform to surrounding areas and surface water drains freely.
9. Mulching:
- a. Mulch all plant pits and beds with 4-inch deep specified mulch.
  - b. Spread mulch solid in planting beds.
  - c. Thickness is uniform throughout.
  - d. Mulch for trees shall be eight (8) feet in diameter from base of tree.
- G. Solid Sod:
- 1. Procure and handle sod per ALDOT Section 654, 2018 Edition.
  - 2. Preparation of Sod Bed:
    - a. Spread and scarify amended topsoil as specified.
    - b. Rake and otherwise manipulate to form smooth-draining grades, remove all stones and clay lumps 1-inch in diameter or larger.
    - c. Leave the surface of the topsoil 1- 1/2-inches below finished grade.
    - d. Do not move heavy objects over areas to be sodded after the soil has been prepared. Planting in compacted areas will not be permitted.
    - e. The finished surface of the areas to be sodded shall be approved by the Landscape Architect prior to sod placement.
  - 3. Solid Sod Placement:
    - a. Lay sod when sod bed is not excessively wet or frozen, but when soil is damp for a depth of 4-inches.
    - b. Immediately upon approval of bed preparation, lay sod smoothly, edge-to-edge, with staggered joints.
    - c. Press firmly into contact with sod bed by tamping or rolling by approved means to eliminate all air pockets, providing a true and even surface, and assuring knitting.
    - d. Fill cracks between sod blocks with strips of living sod, topsoil, or humus.
    - e. Water thoroughly by use of sprinkler or spray, without erosive force.
- H. Seeding: (may not be applicable if Seeding specification is included)
- 1. Furnish, sow, establish and maintain an acceptable growth of specified grass over all disturbed areas not otherwise designated to receive planting, mulch or sod.
  - 2. Ground Preparation: Spread and scarify amended topsoil as specified. Ground preparation shall consist of cultivation to loose depth approximately four (4) inches (minimum). The plowing, harrowing, cultivating, and all other operations shall be performed with proper equipment and in such a manner as to break up all clods, lumps

or earth balls, and remove all boulders, stumps, large roots, or other particles which will interfere with the Work. The resultant surface is to be smooth, uniform, loose, well broken, and fine grained soil providing a suitable bed for seed grass. The ground shall be plowed to the required depth, then cultivated with a rotary tiller and/or disc harrow, in both directions if feasible, until approved. In small or inaccessible areas use of hand tools will be permitted. After removal of all large particles which cannot be broken, the surface shall then be harrowed and tilled. Add sufficient water to wet the soil in order to prepare the ground.

3. Sowing:
  - a. Sowing seed shall follow promptly after the addition of the fertilizer in a uniform manner at the rates specified by Soil Test Reports.
  - b. Sowing shall be done by approved mechanical seeders. Without prejudice to power equipment or seeders of other types and makes, hand operated cyclone sowers, in sufficient number, will be considered mechanical seeders. No sowing shall be done during windy weather, or when the prepared surface is crusted, or when the ground is frozen, wet or otherwise in a non-tillable condition.
  - c. Care shall be exercised during covering operations to preserve the line, grade and cross-section of the seeded areas and to see that areas adjacent to pavement, curbs, etc., are not left higher than the paved surface. Unless otherwise directed, after seed has been sown the seedbed shall be compacted immediately by means of a cultipacker, light roller or approved drag.
4. Mulching: Spread hay or straw mulch to seeded areas at specified rate within 24 hours after the area has been seeded.
5. Care During Construction:
  - a. Water, fill washes, and otherwise protect and maintain the seeded areas including any mulch or cover used until the Work is accepted.
  - b. Repair damage caused by pedestrian and/or vehicular traffic, or other causes.
6. Satisfactory Stand:
  - a. The acceptance of areas designated to be seeded under this Section will be based on verification of a satisfactory stand of grass as determined by an on-site observation by the Landscape Architect.
  - b. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur. Areas viewed by the Landscape Architect to be solid rock will be exempt from this requirement.
  - c. If a satisfactory stand is not established in any area, the area shall be reseeded until a satisfactory stand is established, without additional compensation.
7. Should the site be ready for seeding during a season when, in the opinion of the Landscape Architect, the specified grass will not form a satisfactory cover, establish a cover of Winter Rye and reseed specified grass at earliest time when acceptable growth can be established at no additional cost to the Owner.

### 3.2 **LANDSCAPE MAINTENANCE:**

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- A. See Section 32 9005 Landscape Maintenance

**3.3 SUBSTANTIAL COMPLETION and GUARANTEE:**

- A. Substantial Completion and Payment:
1. Submit written requests for inspection for Substantial Completion to Landscape Architect at least three calendar days prior to anticipated date of inspection and testing.
  2. Substantial Completion cannot be granted and at the same time no further applications for payment shall be for more than 85 percent of Contract until there has been a walk - thru for planting at which time a "punch list" will be written consisting of items to be addressed and corrected by Landscape Contractor immediately. Depending on extent of work on "punch list", Landscape Architect will determine job to be "substantially complete" or pending the completion of punch list".
  3. Submit Record Drawings and Maintenance manuals to Landscape Architect with written request for inspection.
  4. Review "punch list" work jointly with Owner and Landscape Architect for Substantial Completion of total (contract) work.
  5. Upon completion of repairs and replacements found necessary at time of review, Owner and Landscape Architect will confirm date of Substantial Completion and issue written notice of Substantial Completion if items on punch list have been completed. If necessary, another punch list will be written to itemize deficiencies still existing and will be attached to written notice of substantial completion. Landscape Contractor shall complete all "punch list" items if possible within 30 days while continuing maintenance.
  6. Date of Substantial Completion will constitute beginning date of One - Year Guarantee. This date also constitutes beginning of warranty responsibilities and acceptance by Owner and Landscape Architect.
- B. Guarantee:
1. Guarantee all materials and workmanship for a period of 1-year from the Date of Substantial Completion.
  2. During the period of the Guarantee, replace with no additional compensation, and as soon as weather permits, all dead plant materials and all materials not in a thriving condition; replace all other workmanship and materials which are unsatisfactory in the opinion of the Landscape Architect; make good any other damage, loss, destruction, or failure to flourish sufficiently as the result of inferior or defective materials or workmanship, including, but not limited to inadequate drainage.
  3. All replacement material shall match the size attained by original materials at the time of the replacement.
  4. Remove dead or dying material from the site within 5 days of notice, refer to section 1.6 paragraph D(4).
  5. Repair grades and other Work necessitated due to planting replacements.
  6. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacements shall have a similar 1-year Guarantee from date of replacement.
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7. Guarantee applies to losses or damage other than those due to vandalism, Owner neglect, or Acts of Nature, as determined by the Landscape Architect. Acts of Nature, but may not be limited to, high winds of hurricane or tornado force, sleet, hail, freezing rain, and extreme cold (as determined by the Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at fifteen percent (15%) less than original contract price for the damaged work.

**3.4 FINAL INSPECTION and ACCEPTANCE:**

- A. Contractor is responsible for contacting the Landscape Architect at the end of the Guarantee Period to schedule final inspection. Should the Contractor fail to contact the Landscape Architect at this time, the Guarantee Period is automatically extended until he does so.
- B. At the end of the Guarantee Period, submit request for inspection for Final Acceptance to Landscape Architect at least 1-week prior to anticipated date of inspection; include list of Work substantially accepted and list of Work replaced during Guarantee Period.
- C. Upon request for inspection, jointly review with Landscape Architect all guaranteed Work for Final Acceptance.
- D. Remove tree staking apparatus and saucers from all trees, unless otherwise directed; replace mulch to specified thickness.
- E. Upon completion by the Contractor of all required repairs and replacements, the Landscape Architect will confirm the date of Final Acceptance of the Work.

**END OF SECTION 32 9000**

SECTION 32 9100

**PLANTING PREPARATION**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES:**

- A. Soil Preparation
- B. Existing Soil Modifications
- C. Planting Soil Mixes
- D. Fine Grading

**1.2 RELATED SECTIONS**

- A. 32 8400 – Planting Irrigation
- B. 32 9200 – Turf and Grasses
- C. 32 9300 – Plants

**1.3 REFERENCES**

- A. ASTM C 33: Washed Concrete Sand
- B. ASTM C 602: Agricultural Liming Materials
- C. US Composting Council – [www.compostingcouncil.org](http://www.compostingcouncil.org)
- D. US Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.
- E. US EPA 40 CFR Part 503: Standards for the Use or Disposal of Sewage
- F. *Methods of Soil Analysis*, published by the Soil Science Society of America – [www.soils.org](http://www.soils.org)
- G. Unified Soil Classification System (USCS)

**1.4 PRICE AND PAYMENT PROCEDURES**

- A. Allowances
  - B. Alternates
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- C. Unit Pricing

## 1.5 **DEFINITIONS**

- A. Modified Existing Soil: on-site soil that shall be used as Planting Soil after specified modifications.
- B. Soil Fines: Typically soil of low plasticity such as silts and clays per the unified soil classification system. When used in the context of soil amendments; silt soils would typically be the intent of the amendment unless specifically identified. Existing “fine” soils with a high degree of clay must be amended per the following specs.
- C. Subgrade: surface or elevation of subsoil remaining after completion of excavation, or top surface of a fill or backfill, before placing Planting Soil.
- D. Topsoil: naturally produced and harvested soil from the A horizon or upper layers of the pedosphere that have been stockpiled on site or imported.
- E. Planting Soil (Planting Soil Mix): soil mixes described in PART 2 and Modified Existing Soils that will be used to support the life and health of plants after installation.

## 1.6 **SUBMITTALS**

- A. Submit all product submittals eight weeks prior to the start of the soil work.
  - B. Submit 2-gallon samples of each Planting Soil Mix, Coarse Sand, and Compost detailed below to the Landscape Architect. Label each sample with the product/soil type name, characteristics, and locations in the Work. Samples shall be submitted at the same time as the analysis and report of that material.
  - C. Submit manufacturers or supplier’s product data and certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.
    - 1. For each Compost product submit the following analysis by a recognized laboratory:
      - a. pH
      - b. Moisture content %, wet weight basis
    - 2. For Coarse Sand product submit the following analysis by a recognized laboratory:
      - a. pH
      - b. Particle size distribution.
  - D. Soil Testing Reports
    - 1. Submit soil test analysis for all Topsoils and Planting Soil Mixes included in Part 2 of this Section as well as for existing soils at the site.
-

- a. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by the Landscape Architect.
  - b. Soil testing will be at the expense of the Contractor.
2. Provide the following soil properties:
- a. Particle size analysis (% dry weight) and USDA soil texture analysis.
  - b. USDA gradation of gravel, coarse sand, medium sand, fine sand, silt, and clay.
  - c. pH and buffer pH.
  - d. Percent organic content by oven dried weight.
  - e. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil.

### 1.7 **QUALITY ASSURANCE**

- A. The installer shall be a firm having at least five years of experience in projects similar in scope to that required for the Work. The installer of the Work in Section 32 9300 will be the same firm installing the Work in this section.
1. There shall be an experienced full-time supervisor, who can communicate in English, on site during the installation of this Section's Work.
- B. Soil testing laboratory shall be an independent laboratory, with experience and capability to conduct indicated testing and that specializes in USDA agricultural soil testing, soil mix testing, and other tests to be performed. Geotechnical engineering testing labs shall not be used.
- C. Planting Soils shall conform to the approved submittal's sample color, texture and approved test analysis.
1. The Landscape Architect may request samples of delivered or installed soil to be for testing to confirm Planting Soils' conformity to approved material.
  2. Testing shall be performed by the same soil testing laboratory that performed the original soil testing.
  3. Testing results shall be within 10% of values measured in approved Planting Soil Mixes.
- D. Test soil compaction with a penetrometer following installation or modification of Planting Soil. Have a soil penetrometer and moisture meter on site at all times.

### 1.8 **PRE-CONSTRUCTION MEETING**

- A. Schedule a pre-construction meeting with the Landscape Architect at least two weeks before beginning work to discuss the Work, administrative procedures during construction, and project schedule.

## **1.9 PERMITS AND REGULATIONS**

- A. Acquire all permits related to the Work. If a conflict exists between permit requirements and the work outlined in the contract documents, promptly notify the Landscape Architect in writing including a description of any necessary changes and the resulting changes to the contract price.
- B. Adhere to all Federal, State, and local laws and ordinances bearing on the operation or conduct of the work as drawn and specified. This includes, but is not limited to all regulations relating to the inspection for disease and insect control.

## **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.
- B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.
- C. Coordinate bulk material delivery and storage with Landscape Architect and confine materials to neat piles in areas acceptable to Landscape Architect.

## **PART 2 - PRODUCTS**

### **2.1 COMPOST**

- A. Blended and ground leaf, wood and other plant-based material.
  - 1. Commercially prepared and meets the US Compost Council STA/TMECC criteria.
  - 2. Complies with the following parameters:
    - a. pH: 5.5-8.0
    - b. Soluble Salt Concentration: Maximum 10 dS/m.
    - c. Moisture Content: 30 -60%
    - d. Particle Size: 98% pass through ¾ inch screen or smaller.
    - e. Stability: <8 mg CO<sub>2</sub>-C per g OM per day
    - f. Maturity: Minimum 80%
    - g. Physical Contaminants: < 1%

- h. Chemical Contaminants: Meet or exceed USEPA Class A standard, 40CFR § 503.13, Tables 1 and 3.
- i. Biological Contaminants: Meet or exceed USEPA Class A standard, 40CFR § 503.32(a) levels.

**2.2 COARSE SAND**

- A. ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2
  - 1. Clean, sharp, natural coarse sands free of limestone, shale and slate particles with a pH lower than 7.0.
  - 2. Particle size distribution:

3/8 inch (9.5 mm)	100%
No 4 (4.75 mm)	95-100%
No 8 (3.36 mm)	80-100%
No 16 (1.18 mm)	50-85%
No 30 (0.60 mm)	25-60%
No 50 (0.30 mm)	10-30%
No 100 (0.15 mm)	2-10%
No 200 (0.75 mm)	2-5%

**2.3 TOPSOIL**

- A. Fertile, friable, naturally occurring soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy clay, stones larger than 2 inches, noxious weeds and seeds, sticks, brush, litter, or any substance that is harmful to plant growth.
  - 1. Complies with the following criteria:
    - a. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15% and 25%. Combined clay/silt content of no more than 55%.
    - b. pH value shall be between 5.5 and 7.0

- c. Percent organic matter(OM): 5.0% - 10%, by dry weight.
  - d. Soluble salt level: less than 2 mmho/cm.
  - e. Soil chemistry suitable for growing the plants specified.
2. Topsoil existing at the site may be acceptable if it meets the above criteria.

**2.4 PLANTING SOIL MIXES**

A. PLANTING SOIL MIX 1 – Moderately slow draining soil for trees and shrub beds.

1. A mix of Imported Topsoil, Coarse Sand, and Compost. The approximate mix ratio shall be:

Imported Topsoil(unscreened)	45-50%
Coarse Sand	40-45%
Compost	10%

\*Mix component % by moist volume

2. Final tested organic matter between 2.75%-4% by dry weight.
3. Mix Coarse Sand and Compost first, then add Imported Topsoil. Mix with loader bucket, do

Soil Fines	8-12%
Coarse Sand	85-88%
Compost	3-5%

not over mix. Do not use soil blending machine, do not screen the soil. Clumps of soil, Compost, and Coarse Sand will be permitted in overall mix.

4. Add fertilizer according to rates recommended by the soil tests at time of final grading.

B. PLANTING SOIL MIX 2 – Bioretention

1. A mix of soil fines, Coarse Sand, and Compost. The approximate mix ratio shall be:

C. PLANTING SOIL MIX 3 – Structural Soil

1. Add later when structural soil is needed for a project...

**2.5 FERTILIZER**

- A. Fertilizer types and rates are determined upon the soil tests results. Recommended fertilizer shall be added to soil mixes prior to final screening and prior to delivery to project site.

**2.6 LIME**

- A. ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  - 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36 mm) sieve and a minimum of 75 percent passing through No. 60 (0.25 mm) sieve.
  - 2. Form: Provide lime in form of finely ground dolomitic limestone.

**2.7 PRE-EMERGENT HERBICIDES**

- A. Chemical herbicide designed to selectively prevent seeds from germinating. Exact type of herbicide shall be based on the specific plants to be controlled and the most effective date of application.
- B. Submit report of expected weed problems and recommendation of most effective control for approval by Landscape Architect. Provide manufacturer's literature and material certification for recommended product.

**PART 3 - EXECUTION**

**3.1 SITE CONDITIONS:**

- A. Coordinate the Work of this Section with that of other trades.
- B. Be aware of all surface and sub-surface conditions, including utilities, and notify the Landscape Architect, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.
  - 1. Notification of Local Utility Locator Service, 811, is required for all areas within project area: The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the Local Utility Locator Service.
- C. Prior to installation of Planting
  - 1. Confirm that surfaces receiving Planting Soils or modifications to existing soils are free of construction debris, refuse, compressible or biodegradable materials, stones larger than two inches in diameter, soil crusting films of silt or clay that hinders drainage into subsoils, and/or standing water. Remove unsuitable material from site.

2. Confirm no adverse drainage conditions are present.
  3. Confirm that utility work has been completed as indicated in the Drawings.
  4. Confirm that Irrigation work, which is shown to be installed below prepared soil levels, has been completed.
- D. Notify the Landscape Architect immediately of unsatisfactory conditions.

### 3.2 **EXISTING SOIL MODIFICATIONS**

- A. Prepare area by removing existing vegetation and debris. Perform any minor preliminary grading.
- B. MODIFICATION A – SURFACE: REMOVAL & RESREADING
1. Excavate existing soil from areas and to depths indicated on the Drawings. Stockpile in zones indicated on the Drawings or as approved by the Landscape Architect.
  2. Excavate soil using equipment and methods to preserve the clumps and peds in the soil.
  3. Protect stockpiles from erosion by compacting the surface, covering with breathable fabric or annual grasses appropriate for the season, location, and length of storage time.
  4. Re-spread soil from stockpile as indicated in the Drawings.
- C. MODIFICATION B – SURFACE: TILLING
1. Till top 6 inches of soil surface with roto tiller, ripper or agricultural plow.
  2. Spread 2-3 inches of Compost on the surface of tilled soil and make any necessary chemical adjustments as recommended by the soil tests.
  3. Till or disk Compost into the loosened soil. Smooth grades with a drag rake or drag slip.
- D. MODIFICATION C – SURFACE: MINOR TILLING
1. Spread 3-4 inches of Compost over surface of the soil and make necessary chemical adjustments as recommended by the soil tests.
  2. Till Compost into top 6 inches of soil.
- E. MODIFICATION D – SUBSOIL: RADIAL TRENCHING
1. Dig trenches to the extent and depth indicated in the Drawings and details.

2. Backfill trench with soil removed by trenching. Add additional site soil if needed to fill trench to grade and to account for soil settling.

F. MODIFICATION E – SUBSOIL: RIPPING

1. Remove all plants and debris from the surface.
2. Drag a ripping shank or chisel through soil to the depths and at the spacing indicated in the Drawings and details. Use a tracked dozer or similar grading equipment.
3. Spread Compost over the ripped area and till into the soil surface.

G. MODIFICATION F – SUBSOIL: FRACTURING

1. Spread Compost over surface of soil.
2. Using a backhoe, dig through the Compost layer into the soil to the depth indicated in the Drawings. Lift and then drop the loosened soil immediately back into the hole. Move to adjacent area and repeat until entire area has been loosened.
3. Spread Compost over trenches and till into the soil surface.

H. MODIFICATION G – SUBSOIL: TRENCHING

1. Dig trenches to the depths and at the spacing indicated on the Drawings. Maintain an 18 inch standoff from the edges of all curbs, pavements, and structures.
2. Backfill trenches with Compost.
3. Spread Compost over trenches and till into the soil surface.

I. MODIFICATION H – ROOTZONES

1. Add later when project necessitates use of AirSpade or AirKnife.

**3.3 PLANTING SOIL INSTALLATION**

- A. Excavate to the proposed subgrade. Do not over excavate compacted subgrades of adjacent pavements or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along edges of all paving and structures where the bottom of paving or structure is above bottom elevation of excavated planting area.
1. Prior to installing Planting Soil, the Landscape Architect shall approve the condition of the subgrade, subgrade preparation, and subsurface drainage.
  2. Slope subgrade elevations approximately parallel to finished grade elevations and/or towards the subsurface drain lines as indicated in the Drawings.



- B. Equipment used to install or grade Planting Soils shall be wide tracked or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6-inch teeth to scarify any soil that becomes compacted.
- C. Scarify the subgrade material to a depth of 3-6 inches with the teeth of the back hoe, loader buckets, tiller or other suitable device.
  - 1. If area becomes overly compacted, loosen again prior to installing the Planting Soil.
- D. Install Planting Soil in 12-18-inch lifts to required depths. Apply compacting forces to each lift as required to attain required compaction. Scarify the top of each lift 3-6 inches prior to adding another lift.
- E. Phase work such that equipment does not have to operate over previously installed Planting Soil.
- F. Where possible, place large trees first and fill Planting Soil around root ball.
- G. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. Install Planting Soil at a higher level to anticipate the reduction of volume.

#### 3.4 **COMPACTION REQUIREMENTS FOR INSTALLED OR MODIFIED PLANTING SOIL**

- A. Soil compaction shall have a density between 75-250 psi as determined by a penetrometer at a soil moisture approximately midway between wilting point and field capacity.
  - 1. Existing Soil Modifications: compaction measured to depth of modification.
  - 2. Installed Planting Soil: compaction measured to depth of installation.
- B. Maintain moisture conditions within the Planting Soil during installation or modification to allow for satisfactory compaction. Suspend operations if Planting Soil becomes too wet, apply water if the soil is overly dry.
- C. Provide adequate equipment to achieve consistent and uniform compaction of the Planting Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction.
- D. Do not pass motorized equipment over previously installed and compacted soil except as authorized below:
  - 1. Light weight equipment such as trenching machines or motorized wheel barrows.
  - 2. Follow the requirements of Over Compaction Reduction if work after the installation of the Planting Soil compacts the Planting Soil to levels greater than the above requirements.

#### 3.5 **OVER COMPACTION REDUCTION**

- A. Dig up and reinstall any soil that becomes compacted to a density greater than the specified density. This includes compaction caused by other subcontractors after the Planting Soil is installed and approved.
- B. Roto tilling shall not be considered adequate to reduce over compaction at levels six inches or below finished grade.

### 3.6 **INSTALLATION OF CHEMICAL ADDITIVES**

- A. Apply chemical additives following the installation of each soil and prior to fine grading as recommended by the soil test and as appropriate to the soil and plants to be installed.
- B. Types, application rates and methods shall be approved by the Landscape Architect prior to application.

### 3.7 **FINE GRADING**

- A. The Landscape Architect shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.
- B. Grade the finish surface of all planted areas to meet the grades indicated on the Drawings, allowing finished grades to remain higher (10-15% of soil modification depth) than the grades on the grading plan to anticipate settlement over first year.
- C. Utilize hand equipment, small garden tractors with rakes, small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use float bottom of loader bucket.
- D. Provide for positive drainage from all areas toward inlets, drainage structures, and/or edge of planting beds. Adjust grades as directed to reflect actual constructed field conditions of pavements, walls, and inlet elevations. Notify the Landscape Architect if positive drainage is impossible to achieve.
- E. Provide smooth, rounded transitions between slopes of different gradients and direction.
- F. Fill all dips and remove any bumps in the overall plane of the slope.

### 3.8 **INSTALLATION OF COMPOST TILL LAYER**

- A. Spread 3-4 inches of Compost over the beds and rototill into the top 4-6 inches of the Planting Soil after Planting Soils are installed in planting bed areas and prior to installation of shrub & groundcover plantings.

### 3.9 **CLEAN-UP**

- A. Keep site free of trash, pavements reasonably clean and work area in an orderly condition at end of each day. Remove trash and debris from site no less than once a week.
- B. Protect adjacent walls, walks, and utilities from damage or staining by the soil.
- C. Wash all soil from pavements and structures after installation is complete and as needed to prevent damage or staining.
- D. Make all repairs to grades, ruts, and damage done to the Work.
- E. Remove and dispose of excess soils.

**3.10 PLANTING SOIL PROTECTION**

- A. Protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other contractors or trespassers.
  - 1. Repair or replace damage done by the Contractor to any part of the Work, existing features to remain on site, and features adjacent to the site at no expense to the Owner.
- B. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch, plantings, or turf.

**3.11 SUBSTANTIAL COMPLETION ACCEPTANCE**

- A. The date of Substantial Completion of the Planting Soil is the same as the date of Substantial Completion for Section 32 9300 – Plants.

**3.12 FINAL ACCEPTANCE**

- A. The date of Final Acceptance follows the same criteria as outlined in Section 32 9300 – Plants in addition to the following:
  - 1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. Remove plants and mulch before adding soil and then restore planting. Do not add soil over the root balls of plants or on top of mulch.

**END OF SECTION 32 9100**

**SECTION 32 9200**

**TURFS AND GRASSES**

**PART 1 - GENERAL**

**SCOPE**

A. This section pertains to seeding work, including preparing the seedbed, furnishing and placing of topsoil, seed and other required materials for a complete installation to the limits of construction and specified herein. Seeding operations shall be performed on all newly graded earth areas not otherwise specified covered by structures, pavements and/or surfacings, riprap, sod, sprigging, walkways, and other items of a similar nature; on all cleared and/or grubbed areas which are to remain as finish grade surfaces and not to be excavated or embankments constructed thereon; on all existing off site and on site turfed earth surfaces which are disturbed by construction operations and which are to remain as finish grade surfaces; and at all other locations which may be designated on the drawings or specified herein. The contractor shall follow the ALDOT Standard Specifications for Highway Construction, latest edition (ALDOT, 2018) Section 650, 652, 654, 656, 659 and 665.

**RELATED WORK SPECIFIED ELSEWHERE**

- A. Erosion and Sedimentation Controls – Section 31 2500
- B. Sodding – Section 32 9223 (If Indicated on the Drawings)

**PART 2- PRODUCTS**

**TOPSOIL**

- A. Topsoil for planting shall be a rich friable loam containing a large amount of humus and shall be original surface sandy loam, topsoil of good rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2 -inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and perennial weed seeds, and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life. Bermuda grass roots in topsoil will not be accepted, unless otherwise approved by Engineer.

Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, or a combination thereof.

**GRASS SEED**

All seeds shall be labeled in accordance with the U.S.D.A. Rules and Regulations. Seeds shall be packaged in suitable containers in accordance with the Georgia Seed Laws, Rules and Regulations currently in effect. No seed shall be used which has become molded, wet or otherwise damaged. Seed shall be tested by the

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Georgia Department of Agriculture for the purity and germination within six months prior to the date of sowing.

1. Grass seed on level or slightly sloping ground shall consist of the following for the planting dates specified:

- (a) March 1 to June 30
  - Common Bermuda (hulled) 10 lbs./acre
  - Tall Fescue 50 lbs./acre
- (b) August 1 to November 1
  - Tall Fescue 50 lbs./acre
  - Common Bermuda (unhulled) 10 lbs./acre
- (c) November 1 to March 1
  - Common Bermuda (unhulled) 10 lbs./acre

2. Grass seed on slopes 3:1 or steeper and frequently mowed areas shall consist of the following for the planting dates specified:

- (a) March 1 to June 15
  - Weeping Lovegrass 5lbs./acre
  - Sericea Lespedeza (scarified) 60lbs./acre
- (b) August 1 to November 15
  - Tall Fescue 50lbs./acre
  - Sericea Lespedeza (unscarified) 75lbs./acre
- (b) November 1 to March 1
  - Common Bermuda (unhulled) 10lbs./acre
  - Sericea Lespedeza (unscarified) 75lbs./acre

When as directed by the Engineer, an approved quick growing species of grass seed such as rye, Italian rye, millet or other cereal grass, shall be applied at a rate of 30 lbs./acre in conjunction with and in addition to the seed mixture specified above.

### **2.3 SPRIGS**

Bermuda, common, healthy living stolons native to locality of project. Plant on day of removal from growing location. Plant sprigs from March 15 to July 15.

### **2.4 MULCH**

- A. Dry Mulch: Dry mulch shall be straw or hay, consisting of oat, rye or wheat straw, or of pangola, peanut, coastal Bermuda or Bahia grass hay. Only undeteriorated mulch which can be readily cut into the soil shall be used. Application rate shall be 2 ½ tons per acre.
- B. Mulch for hydroseeding: This material shall consist of wood cellulose fiber applied at 500 lbs./acre with dye color equal to Weyerhaeuser Company, or Conway Corporation material used for "hydroseeding" and suitable for this purpose.

### **2.5 FERTILIZER**

- A. Fertilizer shall be a ready mixed material containing the soil nutrients as specified and in a suitable form compatible with the equipment used to achieve uniform distribution of the fertilizer. The fertilizer mixture shall contain the following nutrients expressed in per cent of the total weight: 6% nitrogen, 12% available phosphoric acid, and 12% water soluble potash (6-12-12) analysis. Container tags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition of analysis. Fertilizer shall be applied at 1500 lbs./acre.

### **2.6 LIME**

- A. Agricultural lime shall be within the specifications of the Georgia Department of Agriculture. Ground limestone is calcitic or dolomitic limestone ground so that 90 percent of the material shall pass a 10-mesh sieve, not less than 50 percent will pass through a 50-mesh sieve and at least 25% shall pass a 100-mesh sieve. Lime shall be applied as indicated by soil test, or the rate of 1 to 2 tons per acre.

### **2.7 WATER**

- A. The water used in the grassing operations may be obtained from any approved spring, pond, lake, stream or municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance which might be harmful to plant growth or obnoxious to traffic.

### **2.8 SOD**

- A. Shall be healthy living, disease and weed free grass that has been freshly cut.

### **PART 3 EXECUTION**

#### **3.1 HYDROSEEDING**

- A. The materials for grassing shall consist of a thoroughly mixed slurry of grass seed, fertilizer, lime and mulch as specified. The application rate for wood fiber mulch shall be approximately 500 lbs./acre. All materials shall be discharged within one hour after being combined in the hydroseeder.
- B. Each kind of leguminous seed shall be inoculated separately with the appropriate commercial culture according to instructions of the manufacturer of the material. All inoculated seed shall be protected from the sun and shall be planted the same day it is inoculated.
- C. Equipment for mixing and applying the slurry shall be especially designed for this purpose. It shall be capable of applying a uniform mixture over the entire area to be seeded. The slurry mixture shall be agitated during application to keep the ingredients thoroughly mixed. A suitable metering device to determine the rate of application and assist in obtaining uniform coverage of the grassed areas shall be incorporated as part of the equipment.
- D. Ground preparation for hydroseeding shall be the same as for conventional seeding.
- E. Hydroseeding shall not be performed when windy weather prevents even distribution; when the prepared surface is crusted; or when the ground is frozen, wet or otherwise in a non-tillable condition.

#### **3.2 CONVENTIONAL SEEDING**

- A. Grading and Shaping  

Grade and shape to finish contours and to allow practical use of equipment.
- B. Seedbed Preparation
  - 1. Broadcast Plantings:
    - a. Tillage as a minimum shall: adequately loosen the soil to a depth of 4 to 6 inches; alleviate compaction; incorporate lime and fertilizer; smooth and firm the soil; allow for the proper placement of seed, sprigs, or plants; and allow for the anchoring of straw or hay mulch if a disk is to be used.
    - b. Tillage may be done with any suitable equipment.
    - c. Tillage may be done on the contour where feasible.
    - d. On slopes too steep for the safe operation of tillage equipment. The soil surface will be pitted or trenched across the slope with appropriate hand tools to provide a place 6 to 8 inches apart in which seed may lodge and germinate.
  - 2. Individual Plants:

a. Where individual plants are to be set, the soil will be well prepared by excavating holes, opening furrows, or dibble planting.

b. For nursery stock plants, holes shall be large enough to accommodate roots without crowding.

### **3.3 SPRIGS**

- A. Separate or shred and broadcast over area prepared for planting at 40 cu. ft. per acre. Harrow into ground with disc turned straight.

### **3.4 LIME/FERTILIZER APPLICATION**

- A. Lime and fertilizer will be applied uniformly during land preparation so that it will be mixed with the soil during seedbed preparation. On steep surfaces, scarify slope prior to broadcasting lime and fertilizer.

### **3.5 PLANTING**

A. Seeding will be done on a freshly prepared and firmed seedbed. For broadcast planting, use a cultipacker-seeder, drill, rotary seeder, other mechanical seeder, or hand seeding to distribute the seed uniformly over the area to be treated. Cover the seed lightly with a cultipacker or other suitable equipment.

B. No-till seeding is permissible into annual cover crops when planting is done following maturity of the cover crop or if the temporary cover stand is sparse enough to allow adequate growth of the permanent species.

C. No-till seeding must be done with appropriate no-till seeding equipment. The seed must be uniformly distributed and planted at the proper depth.

### **3.6 MULCHING**

A. All seeded areas shall be mulched. Soil retention blankets, erosion control netting, and other manufactured materials may be required in addition to mulch on unstable soils and concentrated flow areas. Mulch shall be spread uniformly within 24 hours after seeding

### **3.7 WATER, MAINTENANCE AND RESEEDING**

A. Contractor shall be responsible for maintaining the proper moisture content of the soil to ensure adequate plant growth until a satisfactory stand of grass is obtained. Watering shall be performed to maintain an adequate water content in the soil.

B. Contractor shall mow and maintain all seeded areas without additional payment until final acceptance of the work by the Owner, and any regrading, refertilizing, reliming, reseeding or remulching shall be done at his own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand of grass is accomplished. A satisfactory stand of grass is defined as grass that covers at least 98% of the total area with no bare spots larger than one square foot and bare spots shall be scattered such that bare areas do not comprise more than 1/100 of any given area. Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired by filling with topsoil, compacting, and repeating the



seeding work at the Contractor's expense.

**3.8 SODDING**

A. See Section 32 9223 Sodding for additional sod requirements. Smooth grade the specified area to be planted. Apply amendments and fertilizer requirements as determined in soil test. Planting area shall be free of stumps, roots, large stone over 4" diameter, and any other debris. Apply fertilizer and rake into the soil surface. Lightly wet soil surface if dry. Lay the sod at right angles to any major water flow. Sod shall be pinned and secured on slopes greater than 6:1. Sod joints shall be staggered between rows. Sod shall be watered after installation each day.

**END OF SECTION 32 9200**

**SECTION 32 9219 SEEDING  
AND RESTORATION**

**PART 1 - GENERAL**

**1.1 SUMMARY:**

- A. Work described in this section includes site restoration material and general installation.

**1.2 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
1. Section 31 1000 – Site Clearing
  2. Section 31 2000 – Earthwork
  3. Section 31 2500.00 – Erosion and Sedimentation Controls.

**1.3 SUBMITTALS:**

- A. Submit the following items in accordance with Section 01 3300 – Submittal Procedures
1. Product Data for fertilizer and seeds.

**PART 2 - PRODUCTS**

**2.1 TOPSOIL:**

- A. This Contractor shall furnish topsoil in sufficient quantity, to complete grading and planting operations as specified.
- B. Characteristics of topsoil to be furnished:
1. Fertile, friable, naturally occurring. Free of stones, clay, lumps, hardpan, roots, stumps, branches, sticks and other debris larger than two (2) inches in any dimension; free of noxious weeds, grasses, seeds, plants, extraneous matter and any substance harmful to plant growth.
  2. pH: 5.0 to 7.0
  3. Organic Matter: 5% to 10%
  4. Permeability Rate of 5 x 10 <sup>-3</sup> centimeters or greater at 85% compaction.

5. Topsoil from project site may stockpiled and used if it meets the above criteria. Stockpiled topsoil must be protected from weather and construction traffic until it is placed.

**6. SEEDING MIXES:**

- C. All seed shall meet the requirements of these specifications and comply with applicable state law. The type of grass seed to be planted shall meet the approval of the Owner. Seed shall be delivered in sealed bags, properly labeled. Seeds of legumes shall be inoculated just before use with the appropriate culture. Seed mixtures shall be applied at the rate in pounds per acre and with the seasonal limitations shown in the Drawings.

**2.2 FERTILIZER AND LIME:**

- A. After ground preparation is complete, the area to be seeded shall have commercial fertilizer (800 lbs./acre: 13-13-13) and lime (1.5 ton/acre: dolomitic or calcific lime) applied at the applicable rate.

**2.3 HYDRO SEEDING:**

- A. Hydro seeding may be used in areas deemed necessary by the Engineer. Under this method, spread the seed, fertilizer, and wood fiber mulch in the form of a slurry. Seeds of all sizes may be mixed together.

**2.4 MULCHING:**

- A. Areas with permanent grass seed and covered with slope mats or blankets will not require mulch.
- B. Mulching shall consist of covering areas that have been grassed or as otherwise specified with straw. Straw shall be threshed oats, pine, wheat, or rye, and shall be applied at the rate of 1-1/2 tons per acre. Mulch materials shall be free of seeds detrimental to the project.
- C. Mulch shall be free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.

**PART 3 - EXECUTION**

**3.1 SITE PREPARATION:**

- A. Bring the planting area to final grade and install the necessary erosion control measures.
- B. Divert concentrated flows away from the seeded area.
- C. Conduct soil test to determine pH and nutrient content. Roughen the soil by harrowing, tracking, grooving or furrowing.
- D. Apply amendments as needed to adjust pH to 6.0-7.5. Incorporate these amendments into the soil.
- E. Prepare a 3-5 inch (76-127 mm) deep seedbed, with the top 3-4 inches (76-102 mm) consisting of topsoil.

- F. The seedbed should be firm but not compact. The top three inches of soil should be loose, moist and free of large clods and stones.
- G. The topsoil surface should be in reasonably close conformity to the lines, grades and cross sections shown on the grading plans.

### 3.2 **SEEDING:**

- A. Seed to soil contact is the key to good germination.
- B. Furnish, sow, establish and maintain an acceptable growth of specified grass over all disturbed areas not otherwise designated to receive planting, mulch or sod.
- C. Sowing seed shall, in general, follow promptly after incorporation of fertilizer in a uniform manner.
- D. Sowing shall be done by approved mechanical seeders. Without prejudice to power equipment or seeders of other types and makes, hand operated cyclone sowers, in sufficient number, will be considered mechanical seeders. No sowing shall be done during windy weather, or when the prepared surface is crusted, or when the ground is frozen, wet or otherwise in a non-tillable condition.
- E. Immediately after sowing, the seeded area shall be harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil one and one fourth inches (1-¼") thick. After seed is properly covered, the seeded area shall be compacted immediately by means of a cultipacker, light roller, or approved drag.
- F. Care shall be exercised during covering operations to preserve the line, grade and cross-section of the seeded areas and to see that areas adjacent to pavement, curbs, etc., are not left higher than the paved surface.
- G. The Contractor shall water, fill washes, and otherwise protect and maintain the seeded areas until the contract is accepted. It shall be the responsibility of the Contractor to establish and maintain a satisfactory stand of grass, a satisfactory stand being defined as a complete cover of living grass (limited to species expected to germinate in the current season).
- H. Should the site be ready for seeding during a season when, in the opinion of the Engineer, the specified grass will not form a satisfactory cover, establish a cover of Winter Rye and reseed specified grass at earliest time when acceptable growth can be established at no additional cost to the Owner.

### 3.3 **HYDRO SEEDING:**

- A. Apply hydro seeding as follows:
  - 1. Use wood fiber mulch as a metering agent and seed bed regardless of which mulching method is chosen. Apply wood fiber mulch with seed and fertilizer at a minimum coverage of 1,500 to 2,000 lbs/acre.
  - 2. Prepare the ground for hydro seeding the same as for conventional seeding.
  - 3. Use specially designed equipment to mix and apply the slurry uniformly over the entire seeding area.
  - 4. Agitate the slurry mixture during application.

5. Discharge slurry within one hour after being combined in the hydro seeder. Do not hydro seed when winds prevent an even application.
6. Closely follow the equipment manufacturer's directions unless the Engineer modifies the application methods.

7. **MULCHING:**

- B. Apply mulch to seeded areas at specified rate within 24 hours after the area has been seeded.
- C. Evenly apply straw or hay mulch between ¾ inch and 1½ inch deep, according to the texture and moisture content of the mulch material.
- D. Mulch shall allow sunlight to penetrate and air to circulate as well as shade the ground, reduce erosion, and conserve soil moisture. If the type of mulch is not specified on the Plans or in the Specifications, use any of the following as specified.
  1. Mulch with Tackifier: Apply mulch with tackifier regardless of whether using ground or hydro seeding equipment for seeding.
    - a. Mulch uniformly applied manually or with special blower equipment designed for the purpose.
    - b. After distributing the mulch initially, redistribute it to bare or inadequately covered areas in clumps dense enough to prevent new grass from emerging (if required).
    - c. Do not apply mulch on windy days.
    - d. Apply enough tackifier to the mulch to hold it in place. Immediately replace mulch that blows away. If distributing the mulch by hand, immediately apply the tackifier uniformly over the mulched areas.
  2. Walked-in-Mulch: Apply walked-in-mulch on slopes ranging in steepness from 5:1 to 2:1 and treat as follows:
    - a. Immediately walk it into the soil with a cleated track dozer. Make dozer passes vertically up and down the slope.

3.4 **INSPECTION AND MAINTENANCE:**

- A. Newly seeded areas need to be inspected frequently to ensure the grass is growing.
    1. Repair damage caused by pedestrian and/or vehicular traffic, or other causes.
    2. If the seeded area is damaged due to runoff, additional stormwater measures may be needed.
  - B. Satisfactory Stand
    1. The acceptance of areas designated to be seeded under this Section will be based on verification of a satisfactory stand of grass as determined by an on-site observation by the Engineer.
    2. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur. Areas viewed by the Engineer to be solid rock will be exempt from this requirement.
    3. If a satisfactory stand is not established in any area, the area shall be reseeded until a satisfactory stand is established, without additional compensation.
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- C. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.

**END OF SECTION**

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**SECTION 33 1000**

**WATER UTILITIES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - 1. Section 31 2000 - "Earth Moving"
  - 2. Division 22 – Plumbing

**1.2 SUMMARY:**

- A. This Section includes water service piping system, meter, vaults, valves, and appurtenances from the existing on-site utility source of potable water to a point 5 feet outside the building, and as indicated on the Drawings, and in this Section of the Project Manual.
- B. Note that the Contractor shall furnish and install connection, water meter, etc., acceptable to the utility company and call on the utility company to approve the meter and inspect the installation prior to covering.
- C. All fees and charges for water service, meters, taps, permits, impact fees, etc., if any, shall be paid by the Contractor from their contract amount.
- D. The extent of water service piping system, fire hydrants, etc., is indicated on the Drawings, in this Section, other referenced Sections of the Project Manual, and as otherwise required by authorities having jurisdiction.
  - 1. All water pipe which run under roads, streets, driveways, and other vehicular paving shall be sleeved in AWWA C151 ductile iron sleeves.
- E. Utility Compliance: Comply with the Authority Having Jurisdiction regulations and standards pertaining to sanitary sewerage systems.
  - 1. Where conflicts or discrepancies occur with the plans or these specifications, the Authority Having Jurisdiction regulations and standards shall govern.

**1.3 SUBMITTALS:**

- A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections
  - 1. Product data for water service piping and fire protection pipe and specialties.



2. Shop drawings for water vaults, including lids.

## **PART 2 - PRODUCTS**

### **2.1 PIPE AND PIPE FITTINGS - GENERAL:**

- A. General: Pipe, valves, fittings and installation in R.O.W. and on site shall comply with requirements of this Section, other referenced Sections of the Project Manual, the Drawings, and the Authority Having Jurisdiction.
  1. Pipe, fittings, hydrants and valves shall be as specified herein, subject to acceptance by the Authority Having Jurisdiction, unless other specific materials acceptable to the Authority Having Jurisdiction are indicated on the Drawings.
  2. PVC piping and fittings smaller than 4" shall be C900 PVC, Class 200 plastic pipe, Schedule 40, or Type K Copper; and pipe 4" and larger, below paving and fire lines shall be ductile iron, of type(s) acceptable to the Authority Having Jurisdiction, unless other specific materials acceptable to the Authority Having Jurisdiction are indicated on the Drawings.
- B. PVC Plastic, Schedule 40 PVC with pressure-rated fittings: Conform to ASTM D 1785 standard specifications for PVC plastic pipe.
- C. PVC Plastic, Water Pipe: AWWA C900, Class 200. Include elastomeric seal according to ASTM F477.
  1. Ductile Iron Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type, and specifically designed for joining PVC pipe; Include elastomeric seals according to ASTM F 477 or as otherwise required for joining plastic pipe specified
  2. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended in writing by piping system manufacturer, unless otherwise indicated.
- D. Where copper pipe is indicated, provide Soft Copper Tube, ASTM B 88, Type K, water tube, annealed temper.
  1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- E. Ductile-Iron, Push-on-Joint Pipe: AWWA C151 and ANSI C150, C151, A21.50, and A21.15 respectively, Class 350 as approved by the Authority Having Jurisdiction, tar coated outside, with cement lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

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1. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111 (ANSI 21.11) and according to ASTM D-3139.
  2. Joining Materials: AWWA C111 rubber gaskets and lubricant according to ASTM F477 requirements.
- F. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.
1. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
  2. Joining Materials: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
- G. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.
- H. Pipe Sleeves: Provide pipe sleeves at least one size larger than water service piping required below existing concrete and paving, and as follows.
1. Below Concrete, Entry Pads, and Paving Subject to Only Pedestrian Traffic, and for Future Irrigation: Schedule 40 PVC.
  2. Below Concrete, Equipment Pads, Dumpster Pads, Valley Gutters, Curbs and Gutters, Paving Subject to Vehicular Traffic, and Where Indicated: Ductile Iron, as specified above herein this Section.
- I. Identification for Underground Plastic Pipe:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allen Systems, Inc.; Reef Industries, Inc.
    - b. Brady (W.H.) Co.; Signmark Div.
    - c. Calpico, Inc.
    - d. Carlton Industries, Inc.
    - e. EMED Co., Inc.
    - f. Seton Name Plate Co.
  2. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in blue letters "CAUTION - WATER LINE BURIED BELOW."

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**PART 3 - EXECUTION:**

**3.1 INSTALLATION:**

- A. Comply with requirements of Division 22, the International Plumbing Code, Drawings, the Authority Having Jurisdiction and requirements of other authorities having jurisdiction.
- B. Comply with requirements of the State Health Department, the local Health Department, and authorities having jurisdiction.

**3.2 DEPTH OF COVER:**

- A. Provide minimum cover of 30-inches for all water bearing piping.

**3.3 INSTALLATION OF IDENTIFICATION:**

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

**3.4 CLEANING:**

- A. Clean and disinfect water distribution piping as follows, or as required by utility company, Code, and authorities having jurisdiction:
  - 1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
  - 2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:
    - a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
    - b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
    - c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
    - d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

- B. Prepare reports for all purging and disinfecting activities, and submit for review and along with each set of "Record Documents".

**END OF WATER SERVICE PIPING**

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**SECTION 33 3000**

**SANITARY SEWERAGE UTILITIES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - 1. Section 31 2000 - "Earth Moving"
  - 2. Section 03 3100 - "Concrete"
  - 3. Division 22 - "Plumbing"

**1.2 SUMMARY:**

- A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.
- B. The extent of sanitary sewerage system is indicated on the Drawings, in this Section 33 3000, and as otherwise required by authorities having jurisdiction.
- C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the Contractor from their contract amount.

**1.3 SUBMITTALS:**

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  - 1. Product data for drainage piping and specialties.
  - 2. Test Reports.

**1.4 QUALITY ASSURANCE:**

- A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.
- B. Utility Compliance: Comply with the Authority Having Jurisdiction regulations and standards pertaining to sanitary sewerage systems.
  - 1. Where conflicts or discrepancies occur with the plans or these specifications, the Authority Having Jurisdiction regulations and standards shall govern.

- C. Health Department Compliance: Comply with the State Department of Health Code or the local Health Department code, regulations and standards, whichever is more stringent.
- D. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

**1.5 PROJECT CONDITIONS:**

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

**1.6 SEQUENCING AND SCHEDULING:**

- A. Coordinate any connection to public sewer with the Authority Having Jurisdiction.
- B. Coordinate with interior building sanitary drainage piping.
- C. Coordinate with other utility work.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cleanouts:
    - a. Ancon, Inc.
    - b. Josam Co.
    - c. Smith (Jay R.) Mfg. Co.
    - d. Wade Div.; Tyler Pipe.
    - e. Zurn Industries, Inc.; Hydromechanics Div.
  - 2. Underground Warning Tapes:
    - a. Allen Systems, Inc.; Reef Industries, Inc.
    - b. Brady (W.H.) Co.; Signmark Div.
    - c. Calpico, Inc.
    - d. Carlton Industries, Inc.
    - e. EMED Co., Inc.
    - f. Seton Name Plate Co.

**2.2 PIPE AND FITTINGS:**

- A. Ductile-Iron, Gravity Sewer Pipe and Fittings:

1. Pipe: Ductile iron pipe meeting AWWA C-150, C-151 and ANSI A21-50 and A 21.15 for coated outside and cement lined inside. Cement lining according to AWWA C104, Class 350.
  2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
  3. Compact Fittings: AWWA C153, for push-on joints.
  4. Gaskets: AWWA C111, rubber.
- B. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.
- C. Identification for Underground Plastic Pipe:
1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in red letters "CAUTION - SANITARY SEWER LINE BURIED BELOW."

### **2.3 CLEANOUTS:**

- A. General: Provide Mission adjustable repair coupling (or approved equal) with stainless steel bends and stainless-steel shear ring and a Zurn #ZN1400HD-3, Smith 4220 (or approved equal) cover set flush in a minimum 14" square concrete slab.

### **2.4 IDENTIFICATION:**

- A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

## **PART 3 - EXECUTION**

### **3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS:**

- A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill according to provisions in Section 31 2000 – Earth Moving.
- C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

### **3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS:**

- A. Refer to Paragraph 2.2 above.

### **3.3 INSTALLATION, GENERAL:**



- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. Use fittings for changes in direction. Use fittings for branch connections, except where direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- E. Install piping pitched down in direction of flow, at minimum slope of 1 percent, except where indicated otherwise.
- F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.
- G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

### **3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION:**

- A. Join and install ductile iron pipe per ALDOT Standard Specifications.

### **3.5 CLEANOUTS:**

- A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout lid in concrete block 14 by 14 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

### **3.6 TAP CONNECTIONS:**

- A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.
- B. When tapping into existing man holes, use flexible rubber boot in accordance with authority having jurisdiction Environmental Services requirements.
- C. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting

plus 6-inch overlap, with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

- D. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.
  - 1. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
  - 2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.
- E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

### **3.7 INSTALLATION OF IDENTIFICATION:**

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

### **3.8 FIELD QUALITY CONTROL:**

- A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.
- B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
  - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
  - 2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
  - 3. Flush piping between manholes, if required by local authority, to remove collected debris.
- C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
  - 1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
  - 2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

## **END OF SANITARY SEWERAGE UTILITIES**

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**SECTION 33 4001**

**STORM DRAINAGE**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - .. Section 31 2000 - "Earthmoving"
  - .. Section 03 3000 - "Cast-In-Place Concrete"

**1.2 DESCRIPTION OF WORK:**

- A. Work described in this section includes the construction of new storm drainage pipe and structures as shown on the Drawings

**1.3 QUALITY CONTROL:**

- A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of pipe, gaskets, reinforcing steel, cast iron downspout boots, cast iron frames, covers and grates, ready-mix concrete and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.
- B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2014 Edition or most current edition.
- C. Testing: All laboratory and field testing as required to ensure compliance with these specifications will be performed by an independent testing laboratory.
- D. Comply with requirements of the International Plumbing Code, the American Concrete Pipe Association, and authorities having jurisdiction, when more stringent than specified or otherwise indicated

**PART 2 - PRODUCTS**

**2.1 MATERIALS:**

- A. Where indicated, pipe smaller than 12-inches in diameter shall be Schedule 80 PVC, Contech A2000 PVC (or approved equal), or ADS N-12 HP HDPE, unless otherwise indicated on the drawings.
  - 1. Where indicated on the Drawings for "french drain" or "perforated underdrain", pipe shall be equivalent to ADS N-12 (perforated) corrugated HDPE pipe with smooth interior or perforated Contech A2000 PVC, complete with filter fabric "sock" and

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all required or necessary system accessories, fittings, and components, as specified in Article 853.13.

- B. Pipe larger than 12-inches (or equivalent area in arch pipe) shall be Class 3, minimum, reinforced concrete pipe (RCP) as specified in Article 850, or as indicated on the Drawings.
- C. Concrete and reinforcing steel for headwalls, inlets, manholes, and other storm drainage structures shall comply with Alabama Department of Transportation Specification Section 501, and Section 502. Concrete shall be Class “A”, Type 2 (3,000 psi).
- D. Masonry materials and precast concrete units shall conform to Article 621.02.
- E. Castings for frames, covers and grates in drainage structures shall comply with ALDOT Section 836, with particular attention directed to ALDOT Article 836.04, 836.05, 836.06, and 836.07.
  - 1. All manhole covers shall be round.
- F. Identification for Underground Plastic Pipe:
  - 1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in black letters “CAUTION – STORM SEWER LINE BURIED BELOW.”
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allen Systems, Inc.; Reef Industries, Inc.
    - b. Brady (W.H.) Co.; Signmark Div.
    - c. Calpico, Inc.
    - d. Carlton Industries, Inc.
    - e. EMED Co., Inc.
    - f. Seton Name Plate Co.

## **PART 3 - EXECUTION**

### **3.1 STORM DRAIN PIPE:**

- A. Construction requirements, including excavation of trench, placing pipe, and backfilling around pipe shall conform to the applicable portions of Article 530.03 of the Alabama Department of Transportation specifications.
- B. Bedding for storm pipe shall be as shown on the Drawings and as per the pipe manufacturer’s requirements, Type 3 or better installation. Open graded stone, such as #57 stone, is not allowed as backfill.
- C. Compaction requirements for backfill shall be the same as specified for type of surface constructed over the trench, paved or planted areas as described in Section 31 2000 - “Earthmoving.”

- D. Properly coordinate with elevations of grades, footings, other below grade work, and etc.

**3.2 INSTALLATION OF IDENTIFICATION:**

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

**3.3 STRUCTURES:**

- A. Inlets, manholes, cleanouts and other storm drainage structures shall be installed or constructed in accordance with applicable portions of the following sections of the Alabama Highway Department Standard Specifications:
  - 1. Section 501 - Structural Portland Cement Concrete.
  - 2. Section 502 - Steel Reinforcement.
  - 3. Section 613 - Brick and Concrete Block Masonry.
  - 4. Section 620 - Minor Structure Concrete.
  - 5. Section 621 - Inlets, Junction Boxes, Manholes and Miscellaneous Drainage Structures.
  - 6. Section 622 - Resetting Gratings and Covers and for Catch Basins, Inlets, and Manholes.

**END OF STORM DRAINAGE**