PROJECT MANUAL

MORGAN COUNTY EVENT CENTER

Lacey Springs, Alabama

for

Morgan County Commission

(Local Funds)

February 15, 2024

ISSUED FOR BID

Prepared By



Goodwyn, Mills Cawood, LLC

117 Jefferson Street North Huntsville, AL 35801 256 . 539 . 3431 www.gmcnetwork.com

GMC PROJECT NUMBER: AHUN23000



OWNERSHIP OF DOCUMENTS AND DISCLAIMER

The Project Manual, Technical Specifications, Drawings, and all other documents relating to this project have been prepared for this individual and particular project, and for the exclusive use of the original Owner, developer or other party so indicated.

Actual project conditions and as-built conditions may vary significantly. Changes made during bidding, negotiations, construction, due to additions or deletions of portions of this project, and/or for other reasons, may not be indicated in these documents.

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GOODWYN MILLS CAWOOD, LLC.

GMCNETWORK.COM

ARCHITECTURE ■ ENGINEERING ■ ENVIRONMENTAL ■ GEOTECHNICAL ■ INTERIOR DESIGN LANDSCAPE ARCHITECTURE ■ PLANNING ■ SURVEYING ■ TRANSPORTATION

SECTION 00 0101

PROJECT TITLE PAGE

PROJECT MANUAL

FOR

A NEW EVENT CENTER FOR MORGAN COUNTY ARCHITECT'S PROJECT NUMBER: AHUN230008 MORGAN COUNTY COMMISSION 302 LEE STREET, NE DECATUR ALABAMA 35601 COMMISSION CHAIRMAN: RAY LONG DISTRICT ONE COMMISSIONER: JEFF CLARK DISTRICT TWO COMMISSIONER: RANDY VEST DISTRICT THREE COMMISSIONER: DON STISHER DISTRICT FOUR COMMISSIONER: GREG ABERCROMBIE

DATE: February 15, 2024 PREPARED BY: GOODWYN MILLS CAWOOD, LLC.

SECTION 00 0110

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PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Project Name: A New Event Center for Morgan County, located at the corner of Union Hill and Luker Roads, Lacey Springs, Alabama.
- B. The Owner, hereinafter referred to as Owner: Morgan County Commission
- C. Owner's Project Manager: Goodwyn Mills Cawood, LLC.
 - 1. Address: 117 Jefferson Street North
 - 2. City, State, Zip: Huntsville, Alabama 35801.
 - 3. Phone/Fax: (256) 539-3431.

1.02 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute an Invitation to Bid to General Contractors for the construction of the project described below.

1.03 PROJECT DESCRIPTION

- A. Summary Project Description: Construction of a free-stranding Gymnasium with associated site development of approximately 28,280 SF ground footprint with approximately 6,347 of elevated track surface above Gymnasium.
- B. Contract Scope: Construction.
- C. Contract Terms: Lump sum (fixed price, stipulated sum).

1.04 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: Goodwyn Mills Cawood, LLC (GMC)

1.05 PROCUREMENT TIMETABLE

- A. Last Request for Substitution Due: 7 days prior to due date of bids.
- B. Last Request for Information Due: 7 days prior to due date of bids.
- C. Pre-Bid Meeting: March 07, 2024 11:00 A.M. at County Engineers office; 580 Shull Road NE
- D. Bid Due Date: Thursday, March 21, 2024 before 2 PM local time.
- E. Bid Opening: Same day, 2:00 PM local time.
- F. Bids shall be valid for 60 day.
- G. Contract Time: 320 calendar days.
- H. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PROCUREMENT DOCUMENTS

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
 - 1. Bid documents (Plans, Specifications, and Addenda) will be available to General Contractors only, from the Architect electronically with no deposit.
 - 2. General Contractors should contact Shannon Lusk via phone (256) 539-3431 or email_ <u>shannon.lusk@gmcnetwork.com</u> to request electronic documents.
 - 3. Subcontractors should contact a General Contractor or Plan Room for documents.

MORGAN COUNTY EVENT CENTER

FOR THE MORGAN COUNTY COMMISSION

- B. Documents are available electronically with no deposit required.
- C. Documents are on display at the offices of the following construction plan rooms:
 - 1. Construct Connect.
 - 2. Dodge Data & Analytics.
 - 3. GMC Huntsville Office

1.07 BID SECURITY

- A. Bids shall be accompanied by a security deposit as follows:
 - 1. Bid Bond of a sum no less than 10 percent of the Bid Amount on AIA A310 Bid Bond Form.
 - 2. Certified check in the amount of a sum not less than 10 percent of the bid amount, but in no event more than \$10,000.00.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 0103

PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 OWNER:

- A. Name: Morgan County Commission.
 - 1. Address Line 1: 302 Lee Stree NE
 - 2. City: Decatur.
 - 3. State: Alabama.
 - 4. Zip Code: 35601.
- 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: Senior Architect.
 - 2. Name: Jay W. Purkey, AIA NCARB -Sr. Architect
 - 3. Email: jay.purkey@gmcnetwork.com.

1.03 CONSULTANTS:

1.

- 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: Goodwyn Mills Cawood, LLC.
 - a. Address Line 1: 7 117 Jefferson Street North
 - b. City: Huntsville.
 - c. State: Alabama.
 - d. Zip Code: 35801.
 - f. Telephone: (256) 539-3431.
- B. Interior Design Consultant:
 - Company Name: Goodwyn Mills Cawood, LLC.
 - a. Address Line 1: 2400 5th Avenue South.
 - b. Address Line 2: Suite 200.
 - c. City: Birmingham.
 - d. State: Alabama.
 - e. Zip Code: 35233.
 - f. Katy Lucas, IIDA
 - g. Telephone: (205) 879-4462.
- C. Civil Engineering Consultant: (Note: Grading, drainage, paving, & erosion control not shown on the project documents shall be by the Owner and is N.I.C)
 - 1. Company Name: Goodwyn Mills Cawood, LLC.
 - a. Address Line 1: 2400 5th Avenue South.
 - b. Address Line 2: Suite 200.
 - c. City: Birmingham.
 - d. State: Alabama.
 - e. Zip Code: 35233.
 - f. Corey Shoop, PE
 - g. Telephone: (205) 879-4462.
- D. Structural Engineering Consultant:
 - 1. Company Name: Structural Design Group
 - a. Address Line 1: 300 Chase Park South.
 - b. City: Hoover.

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- c. State: Alabama.
- d. Zip Code: 35244.
- f. Telephone: (205) 824-5200.
- 2. Primary Contact: .
 - a. Title: Principal.
 - b. Name: Craig Winn, P.E..
- E. Mechanical Engineering Consultant HVAC and Plumbing:
 - 1. M/W Davis Dumas Associates
 - a. Address Line 1: 4500 Southlake Park.
 - b. Address Line 2: Suite 200.
 - c. City: Hoover.
 - d. State: Alabama.
 - e. Zip Code: 35224.
 - f. Telephone: (205) 252-0246.
 - 2. Primary Contact: .
 - a. Name: Sammy Davis, P.E..
- F. Electrical Engineering Consultant:
 - 1. Company Name: Hyde Engineering, Inc..
 - a. Address Line 1: 1525 Perimeter Parkway.
 - b. Address Line 2: Suite 275.
 - c. City: Huntsville.
 - d. State: Alabama.
 - e. Zip Code: 35806.
 - f. Telephone: (256) 970-8013.
 - 2. Primary Contact: .
 - a. Name: Morgan Reyes, P.E..

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 107

SEALS PAGE

SEAL PAGES FOR ENGINEERS OF RECORD ARE PROVIDED AT THE FRONT OF EACH RESPECTIVE SPECIFICATIONS DIVISIONS

END OF SECTION

ADVERTISEMENT FOR BIDS

<u>SEALED PROPOSALS</u> will be received from General Contractors holding a license in the State of Alabama by (Owner) Morgan County Commission, located at 580 Shull Road NE, Hartselle Alabama 35640; until 2:00 PM Local Time, March 21, 2024 at which time and place they will be publicly opened and read for:

MORGAN COUNTY EVENTS CENTER, LACEY SPRINGS, ALABAMA for MORGAN COUNTY COMMISSION GMC PROJECT: AHUN230008

(LOCALLY FUNDED)

A cashier's check or bid bond payable to (Owner) Morgan County Commission in an amount not less than five (5) percent of the amount of the bid, but in no event more than \$10,000, must accompany the bidder's proposal. Performance and statutory Labor and Material Payment Bonds, and insurance in compliance with requirements, and verification of E-Verify enrollment will be required at the signing of the Contract.

Drawings and Specifications may be examined at the Office of the Architect; Dodge Data & Analytics; Data Fax and ConstructConnect.

Bid documents (Plan, Specifications, and Addenda) will be sent to General Contractors only, from the Architect electronically with no deposit. Subcontractors should contact a General Contractor or plan room for documents. General Contractors should contact Shannon Lusk via email <u>shannon.lusk@gmcnetwork.com</u> to request electronic documents. No bid documents will be distributed later than 24 hours prior to the scheduled opening of bids. For the list of plan holders on this project visit <u>www.gmcnetwork.com/bids/</u>.

Only General Contractors which are properly licensed in accordance with criteria established by the State Licensing Board for General Contractors must be licensed under the Provision of Title 34, Chapter 8, Code of Alabama, 1975, as amended, will be considered for the work of this project.

<u>A PRE-BID CONFER</u> at 11:00AM local time, WEATHER PERMITTING for the purpose of reviewing the project and answering Bidder's questions will be held March 7th at the same address as the bid opening at 580 Shull Road NE, Hartselle. The project site is located at; 382 Union Hill Road, Lacey Springs (corner of Union Hill & Luker Road), Attendance at the Pre-Bid Conference is NOT required for Bidders intending to submit a Proposal, however is highly recommended. If inclement weather is present the meeting will be held at the above referenced address.

Per the Owner and the Alabama Department of Revenue(ADOR), Act 2013-205, the project will be bid **EXCLUDING TAXES** and will require the General Contractor to provide a certificate.. Certificates shall only be issued to contractors licensed by the State Licensing Board for General Contractors or any subcontractor working under the same contract. Items eligible for exemption are building materials, construction materials, and supplies and other tangibles that become part of the structure.

The Owner reserves the right to reject any or all proposals, to waive technical errors and/or abandon the bid process if, in their judgment, the best interests of the Owner will thereby be promoted.

Morgan County Commission 302 Lee Street NE Decatur, Alabama 35601

GOODWYN MILLS CAWOOD, LLC. (GMC)

117 JEFFERSON STREET NORTH HUNTSVILLE, ALABAMA 35801 PHONE: (256) 539-3431 FAX: (256) 536-9913

END OF ADVERTISEMENT

NOTE: For projects exceeding \$50,000, this notice must be run once a week for three successive weeks in a newspaper of general circulation in the county or counties in which the project, or any part of the project, is to be performed. If the project involves an estimated amount exceeding \$500,000, this notice must also be run at least once in three newspapers of general circulation throughout the state. Proof of publication is required.

Electronic File Conversion and Transfer Agreement

Goodwyn Mills Cawood, llc. (GMC) in cooperation with its Consultants may, at its sole discretion, provide electronic document and file conversion services to the prime entity holding, or intending to enter into, an Agreement with an Owner for construction of a Project. GMC will typically accept only one request per project from one entity, typically the General Contractor.

Consultants referred to herein are all consultants to GMC for or in connection with the Project, including but not limited to those listed above.

It is acknowledged that neither GMC nor its Consultants are under any obligation to furnish electronic files to any party. The General Contractor and/or Sub-contractors should not, under any circumstances, assume they will receive any or all requested electronic files. Whether files are provided or not, the General Contractor remains completely responsible for performing all work required of the Contract Documents in full, including the preparation of accurate and detailed required shop-drawings.

When furnished, files will be transmitted electronically via FTP Site, or similar file transfer mechanism. It is the intent of GMC to furnish files in a timely manner, typically within two (2) weeks of receipt of payment of fees. However, the complexity and scale of the conversion is directly related to the requested file format and quantity of files requested. Where GMC believes a request will require additional time, we will notify the User and make reasonable effort to deliver files in phases if beneficial.

Please contact Shannon Lusk at (256) 539-3431 with any questions.

GOODWYN MILLS CAWOOD, LLC.

PROJECT	
Project Name:	Morgan County Event Center
Project No.:	AHUN230008
Document Issue Date:	February 15, 2024
Prime Architect/ Engineer:	GOODWYN MILLS CAWOOD, LLC. Consultants:

Goodwyn Mills Cawood, LLC. (hereafter "GMC"), for itself and its identified Consultants, hereby grants non-exclusive use of the requested electronic files to the party (User) listed below. User accepts that GMC and its Consultants reserve the right to convey or not convey electronic files at their sole discretion. User further agrees, as a precedent to transmittal of digital files to any other party, to require written agreement of equivalent confidentiality and indemnification provisions from any party that receives the digital files. The digital information furnished under this agreement is proprietary, is the property of GMC and/or its Consultants, and is protected by applicable copyright laws.

The information provided by GMC and/or its Consultants is solely for the convenience of the recipient. Neither GMC nor its Consultants make any warranty or guarantee, express or implied, as to the suitability of the files for any specific purpose. It is understood the files are (1) digital, (2) typically have been converted electronically into a format suitable to the User, (3) are inherently capable of being manipulated and altered through intentional and unintentional means, (4)

are partial and therefore inherently incomplete representations of the Contract Documents, and (5) may include inaccuracies clarified elsewhere in the Contract documents. Consequently, ONLY the COMPLETE Printed Contract Documents, as amended, shall serve as the basis for the scope, quantity, and quality of the work required for the Project. Under no circumstances whatsoever shall GMC and/or its Consultants be or become liable to anyone for the accuracy or completeness of information included in requested electronic files. The burden of, and responsibility for, determining the fitness of data included in electronic files falls solely and completely on the User.

LIMITED USE: The use of any digital file(s) is solely limited to the listed Project below. In no event shall files be utilized for any other Project, or any use beyond the use specifically listed herein. Further, under no circumstances may the General Contractor or and Sub-Contractor submit files furnished under this Agreement as required shop drawing submittals. By execution of this Agreement, the User acknowledges these limitations, and shall comply fully therewith.

CONFIDENTIALITY: User agrees to hold Project information strictly confidential, and User agrees it shall limit the use of transmitted electronic files solely to those applications necessary to perform work required for the Project.

INDEMNIFICATION: User hereby agrees to indemnify, defend, and hold harmless GMC, its directors, officers, and employees, and its Consultants, Consultant's directors, Consultants officers and employees, and the insurers, agents, and affiliates of both GMC and its Consultants, from any and all liability including claims for consequential damages or attorney's fees that may arise out of or relate in any matter to the authorized or unauthorized use, reuse, or alteration of this information by User, its employees or agents, vendors, contractors, sub-contractors, or any other party.

REVISIONS: The Contract Documents are subject to change, and revisions are not always incorporated throughout the documents. It is the User's sole responsibility to review the complete current Contract Documents, and identify inconsistencies between the electronic files and the current Contract Documents.

DIGITAL PROTOCOL: The USER is solely responsible for examination of digital files for virus contamination. Neither GMC nor its Consultants, or the directors, officers, employees, insurers, agents, or affiliates of either are responsible for damages incurred due to virus contamination, or for software version and/or file compatibility, or any similar hardware or software compliance issues..

USER ACCEPTANCE OF AGREEMENT

Company Name:	User Name

Ву: _____

Its:

Date: _____

MORGAN COUNTY EVENT CENTER MORGAN COUNTY COMMISSION REQUESTED FILE FORMAT

SCHEDULE OF REQUESTED FILES (To be filled by User)

SHEET		INTENDED USE	FEE	
No.	Name.			

(PRINT ADDITIONAL FORMS AS REQUIRED)

PROPOSAL FORM

To: MORGAN COUNTY COMMISSION Date:
In compliance with your 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: MORGAN COUNTY EVENT CENTER- LACEY SPRINGS, ALABAMA in
accordance with Drawings and Specifications, dated FEBRUARY 15, 2024, prepared by
GOODWYN MILLS CAWOOD, LLC. (Architect's Project No. AHUN230008), 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 No's._____through______inclusively.

MORGAN COUNTY EVENT CENTER MORGAN COUNTY COMMISSION

BASE BID: For construction complete as shown and specified, the sum of:

I	Dollars (\$)
	·

ALTERNATES: NONE

ALTERNATES: If Alternates as set forth in the Bid Documents are accepted, the following adjustments are to be made to the Base Bid (See Section 01 2300 – "Alternates", and Drawings for descriptions and requirements.):

(Add/Deduct) Dollars

(\$_____) (Circle and/or mark-through to indicate whether amount is an Add or Deduct.)

ALLOWANCES:	Refer to Section 01 2100 – "Allowances", and Drawings for descriptions and requirements.
COMPLETION DATE:	All Base Bid and any Alternate Work in the Contract shall be "Substantially Complete" within <u>320</u> consecutive days, from the date of the Owner's written "Notice To Proceed".
UNIT PRICES:	Refer to "Attachment A to Proposal Form", and Section 01 2200 - "Unit Prices" for descriptions and requirements. (Attachment A to Proposal Form DUE along with Proposal Form on Bid Date).
MAJOR SUBCONTRACTO & SUPPLIER LISTING:	PR Refer to "Attachment B to Proposal Form" (DUE along with Proposal Form on Bid Date , <u>or at Contractor's</u> <u>option. turned in to the Owner within 24-hours after receipt of</u> <u>Bids. with a copy to the Architect</u>).
	NOTE THAT ALL SUBCONTRACTORS AND SUPPLIERS ARE SUBJECT TO APPROVAL BY THE OWNER.
ACCOUNTING OF SALES TAX:	Refer to "Attachment C to Proposal Form". (DUE along with Proposal Form on Bid Date).
CHANGES IN WORK:	Changes in the Work shall be addressed as described in General Conditions Article on Changes in the Work (and as modified by Supplementary Conditions).
PERMIT FEE:	Refer to Section 01 0150 – "Special Conditions". (Include amount in Base Bid.)

IMMIGRATION STATUSRefer to "General Conditions" portion of the Project Manual.**VERIFICATION:**(DUE along with Proposal Form on Bid Date.)

1. Executed E-VERIFY "Memorandum of Understanding".

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 60 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.)

□ Surety	Bid Bond, executed by,			as
□ ,	a cashier's check on the		Bank of	
for the Dollar	sum of s			
(\$		_) made payable to the Aw	arding Authority.	
BIDD	ER'S ALABAMA LICEN	SE:		
State L	icense for General Contracting	:		
		License Number	Contractor's DUNS No.	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 is included and attached to the Proposal Form, or will be turned in to the Owner within twenty-four (24) hours after receipt of bids, with a copy to the Architect.

Bidder certifies that vendors, subcontractors and affiliates, that make sales for delivery into Alabama or leases for use in Alabama are registered, collecting, and remitting Alabama state and local sales, use, and /or lease tax on all taxable sales and leases into Alabama. By submitting a proposal,

MORGAN COUNTY EVENT CENTER	LACEY SPRINGS, ALABAMA
MORGAN COUNTY COMMISSION	MORGAN COUNTY, ALABAMA

contractor is hereby certifying that he and his company are in full compliance with Act No. 2006-557, and not barred from bidding or entering into a contract pursuant to 41-4-116 (Code of Alabama 1975), and acknowledge that the awarding authority may declare the contract void if the certification is false.

Legal Name of Bidder	
Mailing Address	
* By (Legal Signature)	
* Name (type or print)	(Seal)
* Title	
Telephone Number	

* 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.

END OF PROPOSAL FORM

CONTRACTOR

ATTACHMENT A

TO PROPOSAL FORM

1.1 <u>UNIT PRICES</u>:

- A. The undersigned proposes the following Unit Prices for additions to or deductions from the Work wherein Unit Prices are applicable as determined by the Architect and Owner. These Unit Prices include all charges for labor and materials, fee, layout, supervision (field and home office), general expenses, taxes, insurance, overhead and profit, for Unit Item of Work in place. The Contract sum shall be increased or decreased based upon quantity difference multiplied by the applicable Unit Price, in accordance with the General Conditions.
- B. Refer to Section 01 2200 "Unit Prices", and to the respective sections of the Specifications for the complete Unit Price Item description.
- C. Submit the following Unit Prices with the Proposal Form on Bid Date.

ITEM DESCRIPTION:		UNIT:*	UNIT PRICE:
1.	Mass Earth Excavation	СҮ	\$
2.	Trench Earth Excavation	CY	\$
3.	Hand Earth Excavation	CY	\$
4.	Additional Soil:		
	a. Topsoil	CY	\$
	b. General or Open Site Areas (Offsite Source)	CY	\$
	c. General or Open Site Areas (Onsite Source)	CY	\$
	d. Trench Backfill	CY	\$
	e. Select Fill (Offsite Source)	CY	\$
	f. Select Fill (Onsite Source)	CY	\$
5.	Rock, Masonry, or Concrete Excavation in Trenches and Pits, below elevations indicated:	CY	\$
6.	Rock, Masonry, or Concrete Excavation in Open Excavation, below elevations indicated:	СҮ	\$
7.	Sod	SY	\$
8.	Concrete Mud Footings	CY	\$

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9.	Undercut & Backfill in Building Control Areas Quantity to Earthwork Allowance: 1000 CY	СҮ	\$
10.	Undercut & Backfill in Non-Building Control Areas	CY	\$
11.	Crushed Stone	TN	\$
12.	Concrete Sidewalk	SF	\$
13.	VCT Flooring	SF	\$
14.	Gypsum Board Ceiling	SF	\$
15.	Painting (Wall)	SF	\$
16.	Painting (Ceiling)	SF	\$
17.	Sealed Concrete	SF	\$
18.	FRP Wall Sheet, 4' x 8'	SF	\$
19.	Toilet Partition, with Door	EA	\$
20.	Toilet Partition, without Door	EA	\$
21.	Urinal Screen	EA	\$
22.	Hollow Metal Doors	EA	\$
23.	Hollow Metal Frames	EA	\$
24.	Athletic Football Locker	EA	\$
25.	Athletic Bench	EA	\$
26.	Chain Link Fence, Galvanized, 5'-0" Ht.	LF	\$
27.	Chain Link Fence, Galvanized, 12'-0" Ht.	LF	\$

(*) Legend to "unit" quantity abbreviations:

CY	Per "Cubic Yard"
SY	Per "Square Yard"
TN	Per "Ton"
CL.	

SF Per "Square Foot" LF Per "Linear Foot"

EA Per "Each"
END OF ATTACHMENT A TO PROPOSAL FORM

CONTRACTOR

ATTACHMENT "B"

TO PROPOSAL FORM

1.1 <u>SUBCONTRACTORS LISTING</u>:

A. Submit the following Subcontractors names with the Proposal Form by 2:00 PM local time on Bid Date, <u>OR</u> at Contractor's option, turned in to the Owner within 24-hours after the time scheduled for the opening of Bids, with a copy to the Architect:

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
1	SECTION 02 4100 - "DEMOLITION":	(FIRM NAME)
		(LOCATION - CITY and STATE)
2	SECTION 03 3100 - "CONCRETE":	(FIRM NAME)
		 (LOCATION - CITY and STATE)
3	SECTION 03 3931 - "CURING, SEALING AND HARDENING CONCRETE FLOORS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
4	SECTION 03 4500 - "ARCHITECTURAL PRECAST CONCRETE":	; (FIRM NAME)
		LOCATION - CITY and STATE)
5	SECTION 04 2000 - "UNIT MASONRY":	; (FIRM NAME)
		LOCATION - CITY and STATE)

6	SECTION 04 7200 - "CAST STONE MASONRY":	(FIRM NAME)
7	SECTION 05 1200 - "STRUCTURAL STEEL":	(FIRM NAME)
		LOCATION - CITY and STATE)
8	SECTION 05 3100 - "STEEL DECK":	; (FIRM NAME)
		 (LOCATION - CITY and STATE)
9	SECTION 05 4000 – "COLD-FORMED METAL FRAMING":	; (FIRM NAME)
		 (LOCATION - CITY and STATE)
10	SECTION 05 4500 - "LIGHT GAUGE STEEL TRUSSES":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
11	SECTION 05 5000 - "METAL FABRICATIONS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
12	SECTION 05 5100 - "METAL STAIRS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
13	SECTION 05 5213 - "PIPE AND TUBE RAILINGS":	(FIRM NAME)
		(LOCATION - CITY and STATE)

14	SECTION 06 1000 - "ROUGH CARPENTRY":	(FIRM NAME) (LOCATION - CITY and STATE)
15	SECTION 06 2000 – "FINISH CARPENTRY":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
16	SECTION 06 4000 - "ARCHITECTURAL WOODWORK":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
17	SECTION 07 1113 - "BITUMINOUS DAMPPROOFING":	; (FIRM NAME)
		LOCATION - CITY and STATE)
18	SECTION 07 1300 - "SHEET WATERPROOFING":	(FIRM NAME)
		(LOCATION - CITY and STATE)
19	SECTION 07 1400 - "FLUID-APPLIED AIR BARRIER":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
20	SECTION 07 2100 - "THERMAL INSULATION":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
21	SECTION 07 2216 - "ROOF BOARD INSULATION (VENTILATED NAIL BASE)":	(FIRM NAME)
		(LOCATION - CITY and STATE)

22	SECTION 07 3113 - "ASPHALT SHINGLES":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	<u>.</u>
23	SECTION 07 4244 - "FIBER CEMENT PANELS":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	·
24	SECTION 07 6200 - "SHEET METAL FLASHING & TRIM":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	<u>.</u>
25	SECTION 07 7100 - "ROOF SPECIALTIES":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	<u>.</u>
26	SECTION 07 7123 - "MANUFACTURED GUTTERS & DOWNSPOUTS":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	•
27	SECTION 07 8400 - "FIRESTOPPING":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	·
28	SECTION 07 9005 - "JOINT SEALERS":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	<u>.</u>
29	SECTION 08 1113 - "STEEL DOORS AND FRAMES":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	<u>.</u>

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30	SECTION 08 1416 - "FLUSH WOOD DOORS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
24		
31	"ACCESS DOORS & PANELS":	(FIRM NAME)
		(LOCATION - CITY and STATE)
		;
32	"ALUMINUM-FRAMED STOREFRONTS":	(FIRM NAME)
		(LOCATION - CITY and STATE)
33	SECTION 08 5413 - "FIBERGLASS WINDOWS":	(FIRM NAME)
		(LOCATION - CITY and STATE)
		:
34	SECTION 08 7100 - "FINISH HARDWARE":	(FIRM NAME)
		(LOCATION - CITY and STATE)
35	"GLAZING":	(FIRM NAME)
		 (LOCATION - CITY and STATE)
36	SECTION 09 2116 - "GYPSUM BOARD ASSEMBLIES":	(FIRM NAME)
		LOCATION - CITY and STATE)
37	SECTION 09 3000 - "TILING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)

38	SECTION 09 5100 - "SUSPENDED ACOUSTICAL CEILINGS"	; (FIRM NAME) (LOCATION - CITY and STATE)
39	SECTION 09 6500 - "RESILIENT FLOORING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
40	SECTION 09 6813 - "TILE CARPETING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
41	SECTION 09 7200 - "WALL COVERINGS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
42	SECTION 09 9100 - "PAINTING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
43	SECTION 10 1100 - "VISUAL DISPLAY UNITS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
44	SECTION 10 1400 - "SIGNAGE":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
45	SECTION 10 2113.18 - "PHENOLIC TOILET COMPARTMENTS":	; (FIRM NAME)
		(LOCATION - CITY and STATE)

46	SECTION 10 2601 - "WALL AND CORNER GUARDS":	(FIRM NAME)
47	SECTION 10 2800 - "TOILET AND BATH ACCESSORIES":	(FIRM NAME)
		(LOCATION - CITY and STATE)
48	SECTION 10 4400 - "FIRE PROTECTION SPECIALTIES":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
49	SECTION 10 5613 - "METAL STORAGE SHELVING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
50	SECTION 10 5623 - "WIRE STORAGE SHELVING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
51	SECTION 10 7316 - "CANOPIES":	; (FIRM NAME)
		LOCATION - CITY and STATE)
52	SECTION 10 7500 - "FLAGPOLES":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
53	SECTION 11 3100 - "KITCHEN AND LAUNDRY EQUIPMENT":	; (FIRM NAME)
		(LOCATION - CITY and STATE)

54	SECTION 12 2113 - "HORIZONTAL LOUVER BLINDS":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_·
55	SECTION 12 3540 - "LAMINATE CASEWORK":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_·
56	SECTION 12 4813 - "ENTRANCE MATS":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_•
57	SECTION 14 2010 - "PASSENGER ELEVATORS":	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_·
58	DIVISION 21 - FIRE SUPPRESSION:	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_·
59	DIVISION 22 - PLUMBING SUBCONTRACTOR:	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_•
60	DIVISION 23 - MECHANICAL SUBCONTRACTOR:	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_·
61	DIVISION 26 - ELECTRICAL SUBCONTRACTOR:	(FIRM NAME)	;
		(LOCATION - CITY and STATE)	_·

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62	DIVISION 27 – COMMUNICATIONS:	; (FIRM NAME)
		(LOCATION - CITY and STATE)
63	DIVISION 28 – ELECTRONIC SAFETY AND SECURITY:	; (FIRM NAME)
		 (LOCATION - CITY and STATE)
64	SECTION 31 1000 - "SITE CLEARING":	; (FIRM NAME)
		 (LOCATION - CITY and STATE)
65	SECTION 31 2000 - "EARTH MOVING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
66	SECTION 31 2500 - "EROSION AND SEDIMENTATION CONTROLS":	; (FIRM NAME)
		LOCATION - CITY and STATE)
67	SECTION 31 3116 - "TERMITE CONTROL":	; (FIRM NAME)
		(LOCATION - CITY and STATE)
68	SECTION 32 1216 - "ASPHALT PAVING":	(FIRM NAME);
		(LOCATION - CITY and STATE)
69	SECTION 32 1313 - "CONCRETE PAVING":	; (FIRM NAME)
		(LOCATION - CITY and STATE)

70	SECTION 32 1613.13 - "CAST-IN-PLACE CONCRETE CURBS AND GUTTERS":	; (FIRM NAME) (LOCATION - CITY and STATE)	·
71	SECTION 32 1623 - "SIDEWALKS":	; (FIRM NAME)	
		(LOCATION - CITY and STATE)	
72	SECTION 32 1723 - "PAVEMENT MARKINGS":	; (FIRM NAME)	;
		(LOCATION - CITY and STATE)	·
73	SECTION 32 3113 - "CHAIN LINK FENCES AND GATES":	; (FIRM NAME)	
		(LOCATION - CITY and STATE)	
74	SECTION 32 3300 - "SITE FURNISHINGS":	; (FIRM NAME)	;
		(LOCATION - CITY and STATE)	
75	SECTION 32 8400 - "PLANTING IRRIGATION":	; (FIRM NAME)	
		(LOCATION - CITY and STATE)	
76	SECTION 32 9200 - "TURF AND GRASSES:	(FIRM NAME)	
		(LOCATION - CITY and STATE)	
77	PLANTS:	; (FIRM NAME)	
		(LOCATION - CITY and STATE)	

78	SECTION 33 3000 – "SANITARY SEWERAGE UTILITIES":	(FIRM NAME) (LOCATION - CITY and STATE)
79	SECTION 33 4000 – "STORM DRAINAGE UTILITIES":	; (FIRM NAME) (LOCATION - CITY and STATE)
80	SECTION 33 4613 – "FOUNDATION DRAINAGE":	; (FIRM NAME) (LOCATION - CITY and STATE)
81	OTHER:	(FIRM NAME) (LOCATION - CITY and STATE)
82	OTHER:	; (FIRM NAME) (LOCATION - CITY and STATE)
83	OTHER:	; (FIRM NAME) (LOCATION - CITY and STATE)
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97	OTHER:	; (FIRM NAME)
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99	OTHER:	; (FIRM NAME)
		(LOCATION - CITY and STATE)
100	OTHER:	; (FIRM NAME)
		(LOCATION - CITY and STATE)
101	OTHER:	(FIRM NAME)
		LOCATION - CITY and STATE)

This list is not necessarily all inclusive. Submit all primary subcontractors whether their trade is listed here or not.

END OF ATTACHMENT "B" TO PROPOSAL FORM

ACCOUNTING OF SALES TAX

Proposal Form

To:	Date:	
(Awarding Authority)		
NAME OF PROJECT		
SALES TAX ACCOUNTING		
Pursuant to Act 2013-205, Section 1(g) the Contra- the bid proposal form as follows:	ctor accounts for the sales tax NOT included in	
	ESTIMATED SALES TAX AMOUN	
BASE BID:	\$\$	
Alternate No. 1 ()	(add)(deduct) \$	
(Insert key word for Alternate)		
Alternate No. 2 ()	(add)(deduct) \$	
	(add)(dadust) \$	
	(add)(deddet) - \$	
Alternate No. 4 ()	(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.

MORGAN COUNTY EVENT CENTER MORGAN COUNTY COMMISSION	LACEY SPRINGS, ALABAMA MORGAN COUNTY, ALABAMA	
Legal Name of Bidder:		
Mailing Address		
* By (Legal Signature)		
* Name (type or print)	(Seal)	
* Title		
Telephone Number		



117 JEFFERSON STREET, NORTH

HUNTSVILLE, ALABAMA 35801 TEL 256.539.3431 FAX 256.536.9913

BIDDER REGISTRATION FORM

PROJECT: MORGAN COUNTY EVENT CENTER

Any and all plan holders intending to submit a bid on the project referenced above must submit a written registration with the Architect prior to bid. There are no exceptions.

Bidder Registrations may be emailed or faxed to: Goodwyn Mills Cawood, attention: Shannon Lusk. Email: <u>shannon.lusk@gmcnetwork.com</u> or Fax: (256) 536-9913. Bids will not be accepted from unregistered bidders. It is the sole responsibility of the Bidder to confirm with the Office of the Architect receipt of registration.

PLEASE PRINT BIDDER'S INFORMATION BELOW.

COMPANY:				
ADDRESS:				
CONTACT:				
PHONE:				
FAX:				
EMAIL:				
SIGNATURE	DATE			
GOODWYN MILLS CAWOOD OFFICE USE ONLY				
Date Received:				
Accepted by:	Date:			

SUBSTITUTION REQUEST

Project:	Substitution Request Number:			
	From:			
То:	Date:			
Attn:	A/E Project No.:			
Re:	Contract For:			
Specification Title:	Description:			
Section:	Page and Paragraph:			
Proposed Substitution:				
Trade Name:				
Manufacturer:	Model No.:			
Mfg. AddressCity, State, zip:	Phone:			
 The Undersigned certifies: Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product. Same warranty will be furnished for proposed substitution as for specified product. Same maintenance service and source of replacement parts, as applicable, is available. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule. Proposed substitution does not affect dimensions and functional clearances. Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by 				
Submitted by:				
Firm:				
Address:				
Telephone:E-mail:				
A/E's REVIEW AND ACTION Substitution approved - Make submittals in accordance with Specifications, Substitution Procedures. Substitution approved as noted - Make submittals in accordance with Specifications Substitution Procedures. Substitution rejected - Use specified materials. Substitution Request received too late - Use specified materials. Signed by: Date:				
Supporting Data Attached: Drawings Product Data] Samples 📋 Tests 📋 Reports 🛛 🛄			

SECTION 00 2113

INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 RELATED DOCUMENTS

- A. Document 01 1000 Summary.
- B. Document 00 1113 Advertisement for Bids.
- C. Document 00 3100 Available Project Information.
- D. Document 00 4100 Bid Form.
- E. Document 00 4110 Attachment A to Proposal Form Unit Prices
- F. Document 00 4120 Attachment B to Proposal Form Subcontractor Listings
- G. Document 00 4130 Attachment C to Proposal Form Accounting for Sales Tax
- H. Document 00 4373 Proposed Schedule of Values Form.
- I. Document 00 7300 Supplementary Conditions:

BID DOCUMENTS AND CONTRACT DOCUMENTS

2.01 **DEFINITIONS**

A. Bid Documents: Contract Documents supplemented with Invitation To Bid, Instructions to Bidders, Information Available to Bidders, Bid Form Supplements To Bid Forms and Appendices identified.

2.02 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are identified as Project Number AHUN170001, as prepared by Architect, and with contents as identified in the Table of Contents.

2.03 AVAILABILITY

A. Bid documents (Plans, Specifications, and Addenda) will be available to General Contractors only, from the Architect electronically with no deposit. General Contractors should contact Patty Gerecht via phone (256) 539-3431 or e-mail patty.gerecht@gmcnetwork.com to request electronic documents. Subcontractors should contact a General Contractor or plan room for documents.

2.04 EXAMINATION

- A. Bid Documents may be viewed at the office of Owner.
- B. Bid Documents are on display at the offices of the following construction plan rooms:
- C. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.
- D. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

2.05 INQUIRIES/ADDENDA

- A. Direct questions to Patty Gerecht using 01 3010 RFI Form included in the Project Manual, email; patty.gerecht@gmcnetwork.com.
- B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.

D. Clarifications requested by bidders must be in writing not less than 3 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients and Plan Rooms.

2.06 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

- A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 5 days before receipt of bids.
- B. All request for substitutions must be submitted by a General Contractor listed as a Registered Plan Holder.
- C. All request for substitutions from General Contractors must be submitted on 01 6050 SUBSTITUTION REQUEST form provided in Project Manual.
 - 1. Any Substitution Request not submitted on 01 6050 SUBSTITUTION REQUEST form or submitted by entities other than Registered General Contractors will not be reviewed or considered.
- D. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.
- E. The submission shall provide sufficient information to determine acceptability of such products.
- F. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- G. Provide products as specified unless substitutions are submitted in this manner and accepted.
- H. See Section 01 6000 Product Requirements for additional requirements.

SITE ASSESSMENT

3.01 SITE EXAMINATION

A. Examine the project site before submitting a bid.

3.02 PREBID CONFERENCE

- A. A bidders conference has been scheduled for 2:00 p.m. on the 10th day of October, 2017 at the location of bid opening.
- B. All general contract bidders and suppliers are invited.
- C. Representatives of Architect will be in attendance.
- D. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

BID SUBMISSION

4.01 SUBMISSION PROCEDURE

- A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.
- B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
- C. Improperly completed information, irregularities in security deposit, may be cause not to open the Bid Form envelope and declare the bid invalid or informal.

MORGAN COUNTY COMMISSION

4.02 BID INELIGIBILITY

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may, at the discretion of Owner, be declared unacceptable.
- C. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, be waived.
- D. Bids are by invitation, only from selected bidders. Bids from unsolicited bidders may be returned.

BID ENCLOSURES/REQUIREMENTS

5.01 SECURITY DEPOSIT

- A. Bids shall be accompanied by a security deposit as follows:
 - 1. Bid Bond of a sum no less than 10 percent of the Bid Amount on AIA A310 Bid Bond Form.
 - 2. Certified check in the amount of \$a sum no less than 10 percent of the Bid Amount, but in no case not more than \$10,000.00.
- B. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.
- C. Include the cost of bid security in the Bid Amount.
- D. If no contract is awarded, all security deposits will be returned.

5.02 PERFORMANCE ASSURANCE

- A. Accepted Bidder: Provide a Performance bond as described in 00 7300 Supplementary Conditions.
- B. Include the cost of performance assurance bonds in the Bid Amount.

5.03 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

5.04 SALES AND USE TAXES

A. Project is not subject to sales tax and Bidders must include a completed 00 4130 Attachment C to Bid Proposal - Accounting for Sales Tax.

5.05 BID FORM SIGNATURE

- A. The Bid Form shall be signed by the bidder, as follows:
 - 1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.
 - 2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
 - 3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the

by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.

OFFER ACCEPTANCE/REJECTION

6.01 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

6.02 ACCEPTANCE OF OFFER

- A. Owner reserves the right to accept or reject any or all offers.
- B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written letter of Contract Award.

END OF SECTION

SECTION 00 5000

CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

- A. The Agreement form is AIA A101.
- B. The General Conditions are AIA A201.

1.03 FORMS

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.
- B. Bond Forms:
 - 1. Bid Bond Form: AIA A310.
 - 2. Performance and Payment Bond Form: AIA A312.
- C. Post-Award Certificates and Other Forms:
 - 1. Schedule of Values Form: AIA G703.
 - 2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).
- D. Clarification and Modification Forms:
 - 1. Construction Change Directive Form: AIA G714.
 - 2. Change Order Form: AIA G701.
- E. Closeout Forms:
 - 1. Certificate of Substantial Completion Form: AIA G704.

1.04 REFERENCE STANDARDS

- A. AIA A101 Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2007.
- B. AIA A201 General Conditions of the Contract for Construction; 2007.
- C. AIA A310 Bid Bond; 2010.
- D. AIA A312 Performance Bond and Payment Bond; 2010.
- E. AIA G701 Change Order; 2001.
- F. AIA G702 Application and Certificate for Payment; 1992.
- G. AIA G703 Continuation Sheet; 1992.
- H. AIA G704 Certificate of Substantial Completion; 2000.
- I. AIA G714 Construction Change Directive; 2007.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 5200

AGREEMENT FORM

PART 1 GENERAL

- 1.01 FORM OF AGREEMENT
- 1.02 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.
- 1.03 RELATED REQUIREMENTS
 - A. Section 00 7200 General Conditions.

1.04 MODIFICATIONS TO THE AGREEMENT FORM

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF AGREEMENT FORM

AIA[®] Document A101" - 2017

Standard Form of agreement Between Owner and Contractor where the basis of payment is a Stipulated Some

AGREEMENT made as of the day of in the year (*In words, indicate day, month and year.*)

BET¥¥EEN the Owner: (*Name, legal status, address and other information*)

and the Contractor: (*Name, legal status, address and other information*)

for the following Project: *(Name, location and detailed description)*

Morgan County Event Center

The Architect: (*Name, legal status, address and other information*)

Goodwyn Mills Cawood, llc. <u>117 Jefferson Street, North</u> <u>Huntsville Alabama 35801</u> <u>Telephone Number: (256) 539-3431</u>

The Owner and Contractor agree as follows.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to i\s'completion or modification.

The parties should oomplete A101 —2017, Exhibit A, Insurance and Bonds, contemporaneously with thie Agreement. AIA Document A201*-2017, General Conditions of the ContraM for Construction, is adopted in this document by reference. Do not use wi\fto\her general condnions unless this document is modified.

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TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE 9/ORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- **4 CONTRACT SUM**
- **5** PAYMENTS
- 6 **DISPUTE RESOLUTION**
- 7 TERMINATION OR SUSPENSION
- MISCELLANEOUS PROVISIONS 8
- ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, aad other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 5.1 The date of commencement of the Work shall be: (Check one of the following boxes.)

[] The date of this Agreement.

[] A date set forth in a notice to proceed issued by the Owner.

[] Established as follows:

(Insert a date or a means to determine the date of commencement of the H'ork.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work: (Check one of the following boxes and complete the necessary information.)

[] Not later than () calendar days from the date of commencement of the Work.

[] By the following date:

) 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work ar*eto* be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, ifi any, included in the Contract Sum:

§4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a **Modification to** this Agreement. (*Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.*)

Item	Price	Conditions for Acceptance
§ 4.3 Allowances, if any, includ (Identify each allowance.)	ed in the Contract Sum:	
Item	Price	
§ 4.4 Unit prices, if any: (Identify the item and slave the	unit price and quantity limitations, if any, to	which the unit price will be applicable.)
Item	Units and Limitations	Price per Unit (50.00)

§ 4.8 Liquidated damages, if any: *(Insert terms and conditions for liguidated damages, if any.)*

§ 4.6 Other: (Insert provisions for bonus or other incentives, if any, foal might result in a change to the Contract Sum.)

ARTIGLE 5 PAY9iEHTS

§ 5.I Progress Payment

§ 5.4.4 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§6.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than () days after the Architect receives the Application for Pavment.

(Federal, scale or local lan's may require payment within a certain period of time.)

§ 5.4.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 6.4.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201* 2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably .2 stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by tht Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if aay, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201-2017; and
- .S Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§5.1.7.1 I-oreach progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

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§ 8.1.7.1.4 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ S.4.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions [or such modifications.]

§5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage upon Substantial Completion)

§5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A20t-20t7.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§S.t.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contact except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, aad to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located

(Insert rate of interest agreed upon, if any.)

ARTICLE 6 DISPUTE RESOLUTION

§ &1 Initlal Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201—2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker. (If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, *if other than the Architect.*)

AIA Document A101 - g0fi7. Copyrigt\/ 6 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963 1867, 1s)4. 187z, I aa7, 1ee1, 1997, 200a and 2017 by The American Institute of Architects. All rights inserted. WAR NING: Thie AIA* Document is protected by U.S. Copyrig fit Lew and International TBeatles Unauthor4zed reproduction or dletribution of this AIA* Doc ument, or any portion of it, may result in severe civil and criminal penalties, and will be poeeible under the law. This draft wae produced by ATA software at 14:31:56 on 09/28/2017 under Order No. uted to the max imum ext 4721535832 which expires on 03/13/z01e, and is not for resale User Notes:

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201-2017, the method of binding dispute resolution shall be as follows: (Check the appropriate box.)

- (] Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- [] Litigation in a court of competent jurisdiction
- [] Other (*Specify*)

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§7.4 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A20I-2017.

\$7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201—2017, then the Owner shall pay the Contractor a termination fee as follows: (Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner 's comvenience.)

§7.2 The Work may be suspended by the Owner as provided in Article 14 of AlA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§8.4 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative: (Name, address, email address, and other information)

§ 8.5 The Contractor's representative: (*R'ame, address, email address, and olher information*)

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§8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 insurance and Bonds

§8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101*•'— 2017, Standard Forrri of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101' 2017 Exhibit A, and elsewhere in the Contract Documents.

§8.6Notice in electronic format, pursuant to Article 1 of AIA Document A201—2017, may be given in accordance with AIA Document E203*"—2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203—2013, insert requirements for delivering notice in electronic formal such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRAC7 DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .4 Al A Document A 101' 20 17, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101^T 2017, Exhibit A, Insurance and Bonds
- .3 AIA DocumentA201* 2017, General Conditions of the Contract for Construction
- .4 AIA Document E203' 2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert lhe date of the E203-2i1l3 incorporated into this Agreement.)

.5 Drawings

	Number	Title	Date	
6	Specifications			
	Section	Title	Date	Pages
7	Addenda, ifany:			
	Number	Date	Pages	

Portions of Addenda relating to bidding or proposal requirements are not part of ihe Contract Documents un less the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[] AIA Document E204' 2017, Sustainable Projects Exhibit, dated as indicated below: (Insert the date of the E204-2017 incorporated into this Agreement.)

[] The Sustainability Plan: Title Date Pages [] Supplementary and other Conditions of the Contract: Document Title Pages Date

- .9 Other documents, if any, listed below: (List here any additional documents thai are intended to form part of the Contract Documents. AIA Document A201^T 2(177 provides that the advertisement or invitation to bid, Instructions Io Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Conlract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER (Signature)

CONTRACTOR (Signature)

(Printed nome and title)

(Printed name and title)

AIA° Document A312' - 2010

Performance Bond

CONTRACTOR: (Name, legal status and address) SURETY:

(Name, legal status and principal place of business)

OWNER: (Name, legal staius and address)

CONSTRUCTION CONTRACT

Date: Amount: \$ Description: (Name and location)

BOND

Date: (Not earlier than Construction Contrast Date)

Amount: \$ Modifications to this Bond:

None

See Section 16

CONTRACTOR ASPRINCIPAL

Company: (Corporate Seal) Signature:

SURETY Company: Signature:

(Corporate Seal)

Name and Title:

Name and Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORME TIOH ONLY – Name, address and welephone) **OWNER'S REPRESENTATIVE:** AGENT or BROKER:

(Architect, Engineer or other party.)

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Consultation with an attorney is encouraged with respect to

its completion' or modification.

Contractor, Surety, Owner or other party shall be considered plural where applicable.

Any singular reference to

legal consequences.

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§ 4 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

\$ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor arid the Surely agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default:
- the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; .2 arid
- the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the .3 Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surely shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

) b.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors.

\$ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a gualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as
 - practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part find notify the Owner, citing the reasons for denial.

§6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

AIA Document A612 - 2010 Pecfonnence Bond. TI+e American Institute of Arct+itects. All rtghts roeervcd. WARNING: Thi8 AJA* Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of It+le AIA* Document, or any po+tion of is may result in evece civil and criminal penattiee, and will be prosecuted to the maximum eatent possible under the Ian. This dran was produced by AIA software at 14:33.57 on 09/29/2017 under Order No. 4721535832 which expires on 03/13/20t6, and is not for resale. User Notes: (3B9ADA26)

§7 if the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Constriction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

\$10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§J 1 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§J 3 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law frond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. *The* total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

AIA Document A81g - 2010 Pe 'ormance Bond. The American Institute of ArchiWts. All rtgf+Is renewed. WARNING: This AIA* Document is protected by U.S. Copyrigf+I Law and International Treaties. Unauthorized reproduction or distribution of thla AIA" Document, or eny portion of i¢ may reeun in eevere civil and criminal penaTtTee, and will be prosecuted to the maximum extent poeeible under the Igw. TI+is dreft was produced by AIA software at 14:33:67 on 09/39/2017 under Order No. 4721535832 which expires on 03/13/2018, and is not for resale. User Notes: (3B9ADA36)

§ 45 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

CONTRACTOR AS PRINCIPAL Company: Signature:

(Corporate Seal)

SURETY Company: Signature:

(Corporate Seal)

Name and Title: Address: Name and Title: Address:

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AIA[®] Document A312[°] - 2010

Payment Bond

CONTRACTOR: (Name, legal status and address) SURETY: (Name, legal status and principal place of business)

OWNER: (Name, legal status and address) Date: (Not earlier than Construction Contract Dale)

Amount: \$

Modifications to this Bond:

None

See Section 18

CONTRACTOR AS PRINCIPAL Company: *(Corporate Seal)* Signature: SURETY Company: Signature:

(Corporate Seal)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Name arid Title:

Name arid Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMS TION ONLY — Name, address and telephone) AGENT or BROKER: (Architect, Engineer or other party:)

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§2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shah have no obligation under this Bond.

§3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

\$4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 8 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.I have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and .2 have sent a Claim to the Surety (at the address described in Section 13).

§5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; arid

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

\$11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§I 2 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (I) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (I) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§13Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 44 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§IS Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claire. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant:
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- the date on which the Claimant last performed labor or last furnished materials or equipment for use in .5 the performance of the Construction Contract:
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim:
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contact or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 47 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ J8 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)							
CONTRACTOR AS PRINCIPAL		SURETY					
Company:	(Corporate Seal)	Company:	(Corporate Seal)				
Signature:		Signature					
0		c					

Name and Title: Address:

Name and Title: Address-

MORGAN COUNTY COMMISSION

SECTION 00 7200

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.

END OF SECTION

AIA° Document A201"– 2017

General Conditions of the contract for Construction

for the following PROJECT: (Name and location or address)

THE OWNER: (Name, legal status and address)

THE ARCHITECT: (Name, legal statue and address)

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- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contact Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A M dircation is (I) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Constriction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 4.4.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, arid includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.J.4 The Project

The Project is the total construction of which the Wort performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ I.4.I The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other sim ilar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Conelation and Intent of the Contract Documents

§ 1.2.4 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.4 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If ii is determined that aay provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 4.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as 'the" aad "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Qher Instruments of Service

§1.S.4 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Serv ice, including copyrights. The Contractor, Subcontractors, Subsubcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 4.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this aufhorization shall bcar the copyright notice, if aay, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203^{TI}—2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transm ission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

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forth in A]A Document E203* 2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202^T—201 3, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 Genus

§2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.4.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (I) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose i1 to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contactor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§2.3.I Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

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§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the

§2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contact Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6. I.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies lhe Owner may have. correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§3.4.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.4.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. li is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contactor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§8.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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§3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, afler evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§3.5.4 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contactor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, ot shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not vet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fenn, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, tules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are t1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. if either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

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suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Un less otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and .2 other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (I) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable prompmess.

§ 3.9 Superintendent

§3.9.4 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§3.40.1 The Contractor, promptly after being awarded the Contact, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the dale of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Pniect.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (I) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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§ 3.40.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.]2.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§3.42.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.42.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, 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.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittais with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, un less the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Constriction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubission shall not apply to such revisions.

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§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.42.4 0.4 lf professional design services or certifications by a design professionall related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, miles and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§3.]4.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.44.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of tire Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 Ne Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

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§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made knowm to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the A rchitect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of 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 (other than the Work itself), but only to the extent caused by the 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 or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.48.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor. a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner. Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.4 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§4.2.2 The Architect will visit ihe site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed. and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the ContractDocuments.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not

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have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing pollions of the Work.

9 ** * Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the *Owner*. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities perfoming portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 II the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§4.2.42 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contact Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

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§4.2.43 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§4.2.44 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 6.1 Definitions

 \S 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as i£ singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Qther Contracts for Pordtions the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable afler award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (I) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ **5.2.4** The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contact Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents.

similarly make copies of applicable portions of such documents available to their respective proposed Subsubcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ S.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after term initiation of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; arid
- assignment is su bject to the prior rights of the surety, if any, obligated under bond relating to the .2 Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitabTy adjusted for increases in cost resulting from the suspension.

§ S.4.3 Upon assignment to the Owmer under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OTHERS OR BY SEPARATE CONTRACTORS

§6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§6.I.4 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§6.4.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.4.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.4.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Contractor Responsibility

§ 6.2.4 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operation\$ by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the

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Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contactor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ G.2.4 Ne Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3,14.

§ 6.3 Owner's Right to Glean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts or maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .4 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Constriction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation ;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;

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- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .4 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or .2 consumed:
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others:
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article IS.

§ T.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Constriction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor
change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contactor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section I5.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution: or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.4 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 TI unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect rnay require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

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§ 9.3 Applications for Payment

§9.3.4 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not vet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§9.3.2 Unless otherwise provided in the Contact Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon 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, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§9.3.3 The Contractor warrants that title to at I Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, aad equipment relating to the Work.

§ 9.4 Certificates for Payment

§9.4.4 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5. I; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the ConPact Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§9.6.I The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

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be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations lo the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied :
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment:
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum:
- .5 damage to the Owner or a Separate Contractor:
- .6 reasonable evidence that the WorL will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 Afler the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2. 9.6.3 and 9.6.4.

§9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

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§9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and startup, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.0.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented

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to by the insurer and authorized by public authorities having jurisdiction over ihe Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ g.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.4 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilied.

§9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials arid equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.40.3 lf, acer Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Wor(; to comply with the requirements of the Contract Documents;

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- terms of special warranties required by the Contract Documents: or .3
- audits performed by the Owner, if permitted by the Contract Documents, after final payment. .4

§9.40.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.4 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- employees on the Work and other persons who may be affected thereby; I.
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, .3 structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 40.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 40.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 40.2.6 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2. 1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contactor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party 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, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

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§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, 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 (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 40.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 14 INSURANCE AHD BONDS

§ 11.1 Contractor's insurance and Bonds

§41.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contactor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project islocated. The

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Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.4.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 41.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§14.2.3 Notice of Cancellation or Expiration of Owner's Required Property insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an actor omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had ii not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, subsubcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds

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of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section I 1.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person ot entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ J1.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section I 1.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§1 J.5 Adjustment and Settlement of Insured Loss

§ 1J.5.I A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object. the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terns of the proposed settlement or the allocation of the proceeds, the Owner may proceed io settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

\$42.L4 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, ii must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.4.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

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§ 42.2 Correction of Work

§ 42.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§42.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 32.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

\$42.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 32.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

\$42.2.8 Nothing contained in this Section I 2.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 43.1 Successors and Assigns

§43.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the

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other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 43.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 43.3.4 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

g13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.I Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contactor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§[3.4.1 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests aad inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section I 3.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shah be at the Contractor's expense.

§ 43.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 43.6 interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

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ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Wort, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of .3 the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2. .4

§ 14.4.2 The Contractor may terminate the Contract if, through no act or fault of the Contactor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

\$ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§I 4.4.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities perform ing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

- § 44.2.1 The Owner may terminate the Contract if the Contractor
 - .4 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
 - .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;
 - .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority: or
 - .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

\$ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.4 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

- Accept assignment of subcontracts pursuant to Section 5.4; and .2
- Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request .3 of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 44.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

\$14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.I The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ [4.4 Termination by the Owner for Convenience

\$ [4.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ [4.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .4 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts arid purchase orders.

§ 44.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 45.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

\$ 15.4.2 Time Limit on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§[5.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 2 I days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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§45.4.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.4.4.4 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§15.4.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claime for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum. notice as provided in Section I 5.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§[8.1.6.4 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.I.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 45.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damage

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .4 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§45.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set for thin Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§45.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

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Initial Decision Maker's sole discretion, it would be inappropriate for the Initial decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Ma1 (2) when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§J S.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§45.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§45.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be staved pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. if such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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§15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 45.4.4 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 45.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 45.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.4 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law of fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§18.4.4.3 The Owner arid Contractor grant to any person or entity made a party to an arbitration conducted under this Section I 5.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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SECTION 01 1000 SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Owner's Name: Morgan County Commission.
- B. Architect's Name: Goodwyn Mills Cawood, llc..
- C. Additional Project contact information is specified in Section 000103 Project Directory.
- D. The Project consists of the construction of a free-standing even center with 2 enclosed basketball courts, restrooms, meeting room and elevated walking track over the gymnasium portion of the building.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 00 5000 Contracting Forms and Supplements: Forms to be used.
- B. Section 00 5200 Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.
- C. Section 00 7200 General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- D. Section 00 7300 Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- E. Section 01 2100 Allowances: Payment procedures relating to allowances.
- F. Section 01 7800 Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit one electronic and three hard-copies of each Application for Payment.
- I. When Architect requires substantiating information, submit data justifying dollar amounts in que . Provide one copy of data with cover letter for each copy of submittal. Show appendix ion number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within _____ days.
- D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
- E. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contingency allowance.
- B. Inspecting and testing allowances.
- C. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

- A. Funds will be drawn from the Contingency Allowance only by Change Order.
- B. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 INSPECTING AND TESTING ALLOWANCES

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.
- 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 constructed 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 constructed 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 ALLOWANCES:

- A. <u>Allowance No. 1</u> CONTINGENCY:
 - 1. Allow a lump sum price of \$50,000.00 as a Owner Contingency Allowance.
 - 2. Include overhead and profit in Base Bid and not part of Allowance.

B. <u>Allowance No. 2</u> - BRICK MASONRY:

- 1. Field Brick: Allow a unit cost of \$450.00 per thousand for brick units, including purchase, delivery to the job site, and all related costs. Brick colors to be selected by Architect, after award of the Contract for construction of this project.
- 2. Include overhead and profit in Base Bid, and not as part of Allowance.
- 3. Installation of brick masonry and mortar installation and installation materials (grout, ties, reinforcing, etc.) shall be included in Base Bid, and not as part of Allowance.
- 4. Concrete masonry units (CMU), mortar, installation, and installation materials (grout, ties, reinforcing, etc.) shall be in Base Bid, and not as part of Allowance.
- 5. The brick will be modular (7-5/8" x 2-1/4" x 3-5/8" depth), unless otherwise indicated, selected by Architect after bidding, with special shapes as indicated and specified.

C. <u>Allowance No. 3</u> - MASONRY MORTAR:

- 1. Allow a unit cost of \$15.00 per bag, for the purchase of up to one (1) color of colored mortar, delivered to the job site, including all related expenses.
- 2. Include overhead and profit in Base Bid, and not as part of Allowance.

- 3. Masonry, standard gray mortar at interior (painted and unpainted walls see Finish Schedule), concealed masonry work, and all mortar installation and installation materials (grout, ties, reinforcing, etc.) shall be included in Base Bid, and not as part of Allowance.
- 4. Mortar color will be selected by the Architect, after award of the Contract for construction of this project.

D. <u>Allowance No. 4</u> - AID TO CONSTRUCT COST:

- 1. Allow a lump sum price of \$50,000.00 for the Aid to Construct Cost for coordination and connection to on-site utilities. Utility work to 5' outside of the building shall be by the Owner
- 2. Include overhead and profit in Base Bid and not part of Allowance.

END OF SECTION

SECTION 01 2200

UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

- A. Document 00 2113 Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.
- B. Document 00 4322 Unit Prices Form: List of Unit Prices as supplement to Bid Form
- C. Section 01 2000 Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

- A. Assist by providing necessary equipment, workers, and survey personnel as required.
- B. Measurement Devices:
 - 1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
 - 3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.
- C. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- E. Measurement by Area: Measured by square dimension using mean length and width or radius.
- F. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

1.06 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.

- 2. Products determined as unacceptable before or after placement.
- 3. Products not completely unloaded from the transporting vehicle.
- 4. Products placed beyond the lines and levels of the required Work.
- 5. Products remaining on hand after completion of the Work.
- 6. Loading, hauling, and disposing of rejected Products.

1.07 DEFECT ASSESSMENT

- A. Replace Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
 - 1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Owner.
 - 2. The defective Work will be partially repaired to the instructions of the Owner, and the unit price will be adjusted to a new unit price at the discretion of Owner.
- C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.
- D. The authority of Owner to assess the defect and identify payment adjustment is final.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 00 2113 Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 00 4325 Substitution Request Form During Procurement: Required form for substitution requests made before end of Bidding/Negotiation Phase (During Procurement).
- C. Section 01 2100 Allowances, for cash allowances affecting this section.
- D. Section 01 2200 Unit Prices, for additional unit price requirements.
- E. Section 01 3000 Administrative Requirements: Submittal procedures, coordination.
- F. Section 01 6000 Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING BIDDING PHASE

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

- B. Submittal Form (before contract award):
 - 1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 RESOLUTION

A. Architect will notify Contractor in writing of decision to accept or reject request.

3.04 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 3000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Contractor's daily reports.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Requests for Interpretation (RFI) procedures.
- J. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 00 7200 General Conditions: Dates for applications for payment.
- B. Section 01 3216 Construction Progress Schedule: Form, content, and administration of schedules.
- C. Section 01 6000 Product Requirements: General product requirements.
- D. Section 01 7000 Execution and Closeout Requirements: Additional coordination requirements.
- E. Section 01 7800 Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Conform to requirements of Section 01 7000 Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

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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 an Internet-based submittal 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 at no extra charge.
 - 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, or Bluebeam PDF Revu, 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: The selected service is:
 - 1. Procore
- D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
- 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.

3.02 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. 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.
- D. 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.

3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.
- B. Attendance Required:
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Consulting Engineers when needed.
 - 5. Contractor's superintendent.
 - 6. Major subcontractor when needed.
- C. 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 RFIs log and status of responses.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Maintenance of quality and work standards.
 - 11. Effect of proposed changes on progress schedule and coordination.
 - 12. Other business relating to work.
- D. 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 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. List of subcontractors at Project site.
 - 4. Safety, environmental, or industrial relations incidents.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 7. Testing and/or inspections performed.
 - 8. Signature of Contractor's authorized representative.

3.06 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 the 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 the 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.
 - 2. Prepare using software provided by the Electronic Document Submittal Service.
- 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.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
- 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.
- 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.

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3.07 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.

3.08 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 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.
- E. Allow for 10 business days for review and returned submittals by the design team.
- F. The Contractor shall provide a submittal schedule with priority items highlighted with in 10 days of the Notice to Proceed.

3.09 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.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in conformance to 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.
- D. Submit for Owner's benefit during and after project completion.

3.11 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.

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- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.

2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 - 2. Transmit using approved form.
 - a. Use form generated by Electronic Document Submittal Service software.
 - 3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 4. 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.
 - 5. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 10 business 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.
 - 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 7. Provide space for Contractor and Architect review stamps.
 - 8. When revised for resubmission, identify all changes made since previous submission.
- B. Product Data Procedures:
 - 1. Submit only information required by individual specification sections.
 - 2. Collect required information into a single submittal.
 - 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
 - 2. Do not reproduce the 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. Samples Procedures:
 - 1. Transmit related items together as single package.
 - 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.13 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect Ections will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

- D. Architect's and his consultants' actions on items submitted for review:
 - 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 - 2. Not Authorizing fabrication, delivery, and installation:
- E. Architect's and his consultants' actions on items submitted for information:
 - 1. Items for which no action was taken:
 - a. "Received" to notify the Contractor that the submittal has been received for record only.
 - 2. Items for which action was taken:
 - a. "Reviewed" no further action is required from Contractor.

END OF SECTION
SECTION 01 3216

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 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. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

1.03 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.03 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.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.04 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.

3.05 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

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Mock-ups.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Document 00 7200 General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 2100 Allowances: Allowance for payment of testing services.
- C. Section 01 3000 Administrative Requirements: Submittal procedures.
- D. Section 01 6000 Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2016.
- C. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a.
- D. ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.
- F. ASTM E543 Standard Specification for Agencies Performing Nondestructive Testing; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. 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 conforms to 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.
- C. 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.
- D. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.05 REFERENCES AND STANDARDS

- A. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- B. Obtain copies of standards where required by product specification sections.
- C. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. 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. Laboratory: Authorized to operate in the State in which the Project is located.

PART 3 EXECUTION

2.01 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.

2.02 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. Accepted mock-ups shall be a comparison standard for the remaining Work.
- F. 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.

2.03 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.

2.04 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. 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-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. 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.
 - 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.

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 - 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.
 - F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

2.05 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 of 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.

2.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION



01 4100, 01 4100S, 03 3000, 05 1200, 05 3100, 054000

SECTION 01 4100 - 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: wood truss fabricator/installer
- 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.
- 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. Special Inspection for Wind Resistance, Periodic Inspection
 - 1. Roof Cladding and Roof Framing Connections.
 - 2. Wall Connections to Roof.
 - 3. Diaphragms connections to framing.
- I. 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)

Statement of Special Inspections

Project: NEW FIELD HOUSE AT MINOR HIGH SCHOOL

Location: ADAMSVILLE ALABAMA

Owner: JEFFERSON COUNTY BOARD OF EDUCATION

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

Structural Architectural

Mechanical/Electrical/Plumbing

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: or per Schedule Attached Weeklv Prepared by: (type or print name) Signature Date Design Professional Seal Owner's Authorization: Building Official's Acceptance: Date Signature Signature Date **GOODWYN MILLS CAWOOD, LLC SECTION 01 4100** GMC PROJ. NO. - AHUN230008 9 of 14

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.

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

Soils and Foundations	Spray Fire Resistant Material
Cast-In-Place Concrete	Wood Construction
Precast Concrete	Exterior Insulation and Finish
System	
Masonry	Mechanical & Electrical
Systems	
Structural Steel	Architectural Systems
Cold-Formed Steel Framing	Special Cases

Sp	ecial Inspection Agencies	Firm	Address, Telephone, e-mail
1.	Special Inspection		
	Coordinator		
2.	Inspector		
3.	Inspector		
4.	Testing Agency		
5.	Testing Agency		
6.	Other		

Note: The inspectors and testing agencies 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.

Contractor's Statement of Responsibility

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.

S	SCHEDULE OF SPECIAL INSPECTIONS				
Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent	
1.00	Fabricators				
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		ΟΤΑ	
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		ΟΤΑ	
2.00	Soils and Deep Foundations				
2.01	Verify bearing capacities of soils beneath footings.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	ΟΤΑ	
2.02	Verify assumed bearing capacities and determine settlements of soils beneath footings and building pad.	Periodic	As noted on the drawings, recommended by the geotechnical engineer, and specified in earthwork specifications.	ΟΤΑ	
3.00	Concrete Construction				
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			ΟΤΑ	
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	
3.05	Inspect bolts	Periodic		ΟΤΑ	
3.06	Verify each proposed concrete mix for the project.	Periodic	For each proposed mix.	ΟΤΑ	

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
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.	ΟΤΑ
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.	ΟΤΑ
3 10	Inspect Post installed anchors expansion	Periodic		ΟΤΑ
3.11	Inspect Post installed anchors, epoxy anchors	Continuous		OTA
4.00	Masonry Construction			
4.01	Masonry foundation walls are excluded from inspections listed below.			ΟΤΑ
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 square feet of masonry thereafter.	ΟΤΑ
4.03	Inspect masonry cells and cleanouts prior to placement of grout. Inspect grout proportions. Inspect placement of reinforcement.	Periodic	Prior to grouting of masonry.	ΟΤΑ
4.04	Inspect grouting operations to ensure compliance with code and construction documents	Continuous	During grouting.	ΟΤΑ
4.05	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 square feet of masonry thereafter.	ΟΤΑ
4.06	Inspect masonry cells and cleanouts prior to placement of grout. Inspect placement of all grout.	Continuous	During grouting.	OTA
4.07	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.	ΟΤΑ
4.08	Inspect application and measurement of prestressing forces.	Continuous	During tensioning.	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

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
4.10	Inspect preparation of grout specimens, mortar specimens and / or prisms.	Continuous	During preparation of all specimens.	ΟΤΑ
4.11	Verify compliance with all required inspection provisions of the construction documents and approved submittals.	Periodic	As required for duration of project.	OTA
5.00	Steel Construction			
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).	ΟΤΑ
5.02	Inspect high-strength bolting: Bearing-type	Periodic		ΟΤΑ
5.03	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.	ΟΤΑ
5.04	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.	ΟΤΑ
5.05	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	ΟΤΑ
5.06	Inspect welding: Structural Steel: 1) Single-pass fillet welds $\leq 5/16$ " 2) Floor and deck welds.	Periodic	Per specifications and AWS D1.1	ΟΤΑ
5.07	 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.	ΟΤΑ
8.00	Special Inspections for Wind Resistance			
8.01	Roof Cladding and Roof Framing Connections	Periodic		OTA

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
8.02	Wall Connections to Roof and Floor Diaphragms and Framing	Periodic		ΟΤΑ
8.03	Roof and Floor Diaphragm Systems, including Collectors, Drag Struts, and Boundary Elements.	Periodic		ΟΤΑ
8.04	Vertical Windforce-Resisting Systems, including Braced Frames, Moment Frames, and Shearwalls	Periodic		ΟΤΑ
8.05	Windforce-Resisting System Connections to the Foundation.	Periodic		ΟΤΑ
8.06	Fabrication and installation of components and assemblies required to meet the impact-resistance requirements of Section 1609.1.4.	Periodic		ΟΤΑ
9.00	Special Inspections for Seismic Resistance			
9.01	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.	ΟΤΑ
9.02	Inspect nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system including drag-struts,	Periodic		ΟΤΑ
9.03	Inspect welding operations of cold-formed steel framing elements of the seismic-force-resisting	Periodic		ΟΤΑ
9.04	Inspect screw attachment, bolting, anchoring and other fastening of cold-formed steel framing components within the seismic-force-resisting	Periodic		ΟΤΑ
9.05	Certificates of compliance used in masonry		Prior to construction.	ΟΤΑ
9.06	Verify masonry <i>f</i> 'm.		Prior to construction.	OTA
9.07	Test masonry fm .	Periodic	Test for each 5000 sf of	OTA
9.08	Verification of proportions of materials in mortar and grout as delivered to the site	Periodic	mason y.	OTA
9.09	Review certified mill test reports of all concrete reinforcing.			OTA

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
9.10	Submit certificate of compliance for designated seismic system components			ΟΤΑ
INSPEC	CTION AGENTS	4		
#	Firm, Address, Telephone			
	300 CHASE PARK SOUTH SUITE 125			
SDG	HOOVER, AL 35244. 205-824-5200			

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.

Is the Schedule of Special Inspection Services part of a Quality Assurance Plan as defined in Sections 1705 or 1706 of the Building Code?

SECTION 01 4219

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.02 RELATED REQUIREMENTS

A. Document 00 7200 - General Conditions: Reference standards.

1.03 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. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.01 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

2.02 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL

- A. ACI 318 Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).
- B. TMS 402/602 Building Code Requirements and Specification for Masonry Structures; 2016.

2.03 ASTM A SERIES -- ASTM INTERNATIONAL

- A. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- C. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- E. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- F. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- G. ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

2.04 ASTM B SERIES -- ASTM INTERNATIONAL

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2016.

MORGAN COUNTY EVENT CENTER

MORGAN COUNTY COMMISSION

2.05 ASTM C SERIES -- ASTM INTERNATIONAL

- A. ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2015ae1.
- B. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units; 2016.
- C. ASTM C91/C91M Standard Specification for Masonry Cement; 2012.
- D. ASTM C129 Standard Specification for Nonloadbearing Concrete Masonry Units; 2014a.
- E. ASTM C144 Standard Specification for Aggregate for Masonry Mortar; 2011.
- F. ASTM C150/C150M Standard Specification for Portland Cement; 2016.
- G. ASTM C172/C172M Standard Practice for Sampling Freshly Mixed Concrete; 2014a.
- H. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- I. ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2016.
- J. ASTM C270 Standard Specification for Mortar for Unit Masonry; 2014a.
- K. ASTM C387/C387M Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2015.
- L. ASTM C404 Standard Specification for Aggregates for Masonry Grout; 2011.
- M. ASTM C476 Standard Specification for Grout for Masonry; 2016.
- N. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2016.
- O. ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- P. ASTM C1021 Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- Q. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- R. ASTM C1063 Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2016c.
- S. ASTM C1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2016.
- T. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a.
- U. ASTM C1397 Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2013.

2.06 ASTM D SERIES -- ASTM INTERNATIONAL

- A. ASTM D226/D226M Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- B. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2015a).
- C. ASTM D968 Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2015.

- D. ASTM D1970/D1970M Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.
- E. ASTM D2240 Standard Test Method for Rubber Property--Durometer Hardness; 2015.
- F. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2015.
- G. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- H. ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- I. ASTM D4637/D4637M Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.
- J. ASTM D4873/D4873M Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2016.

2.07 ASTM E SERIES -- ASTM INTERNATIONAL

- A. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- B. ASTM E96/E96M Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- C. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.
- D. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- E. ASTM E543 Standard Specification for Agencies Performing Nondestructive Testing; 2015.
- F. ASTM E935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.
- G. ASTM E985 Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- H. ASTM E2178 Standard Test Method for Air Permeance of Building Materials; 2013.
- I. ASTM E2486/E2486M Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS); 2013.

2.08 ASTM G SERIES -- ASTM INTERNATIONAL

- A. ASTM G153 Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.
- B. ASTM G155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

2.09 AWI/AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK INSTITUTE/ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

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2.10 AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE

A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

2.11 BIA -- BRICK INDUSTRY ASSOCIATION

- A. BIA Technical Notes No. 7 Water Penetration Resistance Design and Detailing; 2005.
- B. BIA Technical Notes No. 28B Brick Veneer/Steel Stud Walls; 2005.
- C. BIA Technical Notes No. 46 Maintenance of Brick Masonry; 2005.

2.12 ICC-ES -- ICC EVALUATION SERVICE, INC.

- ICC-ES AC38 Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.
- B. ICC-ES AC219 Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2014).
- C. ICC-ES AC235 Acceptance Criteria for EIFS Clad Drainage Wall Assemblies; 2004 (Editorially revised 2009).

2.13 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

- A. NFPA 80 Standard for Fire Doors and Other Opening Protectives; 2016.
- B. NFPA 259 Standard Test Method for Potential Heat of Building Materials; 2013.
- C. NFPA 268 Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2012.
- D. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

2.14 UL -- UNDERWRITERS LABORATORIES INC.

- A. UL (FRD) Fire Resistance Directory; current edition.
- B. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Project identification sign.
- H. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 5100 Temporary Utilities.
- B. Section 01 5213 Field Offices and Sheds.
- C. Section 01 5500 Vehicular Access and Parking.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.05 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.

1.06 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. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

A. Coordinate access and haul routes with governing authorities and Owner.

- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 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.

1.10 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on Drawings.
- B. Erect on site at location indicated.
- C. No other signs are allowed without Owner permission except those required by law.

1.11 FIELD OFFICES - SEE SECTION 01 5213

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5100

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

- A. Section 01 5000 Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service required from utility source.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- D. Provide main service disconnect and over-current protection at convenient location and meter.
- E. Permanent convenience receptacles may be utilized during construction.
- F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft .
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.

1.05 TEMPORARY HEATING

- A. Cost of Energy: By Contractor.
- B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY COOLING

- A. Cost of Energy: By Contractor.
- B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.07 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.
B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

FIELD OFFICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary field offices for use of Contractor.

1.02 RELATED REQUIREMENTS

- A. Section 01 5000 Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.

1.03 USE OF EXISTING FACILITIES

A. Existing facilities shall not be used for field offices.

1.04 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Other Furnishings: Contractor's option.

2.03 OWNER AND ARCHITECT/ENGINEER OFFICE

PART 3 EXECUTION

3.01 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.03 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Access roads.
- B. Parking.
- C. Permanent pavements and parking facilities.
- D. Construction parking controls.
- E. Maintenance.
- F. Removal, repair.
- G. Mud from site vehicles.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Temporary Construction: Contractor's option.
- B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 5813 - Temporary Project Signage.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

- A. Use of existing on-site streets and driveways for construction traffic is permitted.
- B. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.
- C. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.
- D. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

- A. Use of designated areas of new parking facilities by construction personnel is permitted.
- B. Arrange for temporary parking areas to accommodate use of construction personnel.

3.04 PERMANENT PAVEMENTS AND PARKING FACILITIES

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
- B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

3.06 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.07 REMOVAL, REPAIR

- A. Remove temporary roads when permanent paving is usable.
- B. Repair damage caused by installation.

3.08 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

- A. ASTM D4873/D4873M Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2016.
- B. EPA (NPDES) National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- C. FHWA FLP-94-005 Best Management Practices for Erosion and Sediment Control; 1995.

1.03 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of State of Alabama Erosion and Sedimentation Control Manual.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

- H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- L. Open Water: Prevent standing water that could become stagnant.
- M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 - 1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.

- f. Format required by law is acceptable, provided any additional information specified is also included.
- 2. Obtain the approval of the Plan by authorities having jurisdiction.
- 3. Obtain the approval of the Plan by Owner.
- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 3 EXECUTION

2.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

2.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

2.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet..
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

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- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

2.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches.
 - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.
- B. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 - 5. Install with top of fabric at nominal height and embedment as specified.
 - 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 - 7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Straw Bale Rows:
 - 1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 - 2. Install bales so that bindings are not in contact with the ground.
 - 3. Embed bales at least 4 inches in the ground.
 - 4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 - 5. Fill gaps between ends of bales with loose straw wedged tightly.
 - 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Large Areas:
 - 1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
- E. Mulching Over Small and Medium Areas:
 - 1. Dry Straw and Hay: Apply 4 to 6 inches depth.
- F. Temporary Seeding:
 - 1. When hydraulic seeder is used, seedbed preparation is not required.
 - 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.

- 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
- 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
- 5. Incorporate fertilizer into soil before seeding.
- 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
- 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
- 8. Repeat irrigation as required until grass is established.

2.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 - 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 - 2. Remove silt deposits that exceed one-third of the height of the fence.
 - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 - 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 - 2. Remove silt deposits that exceed one-half of the height of the bales.
 - 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

2.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

1.02 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

2.01 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.
- C. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- D. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

- A. One painted sign, 48 sq ft area, bottom 6 feet above ground.
- 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 and Consultants.
 - 4. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Install sign surface plumb and level, with butt joints. Anchor securely.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 2500 Substitution Procedures: Substitutions made during and after the Bidding/Negotiation Phase.
- B. Section 01 6116 Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- C. Section 01 7419 Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 SUBMITTALS

- A. 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.
- B. 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.
- C. 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

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Containing lead, cadmium, asbestos.
- C. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 6116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
 - 3. Have a published GreenScreen Chemical Hazard Analysis.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

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- 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.

2.03 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

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 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.

3.03 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.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.

- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 Administrative Requirements: Submittal procedures.
- B. Section 01 4000 Quality Requirements: Procedures for testing and certifications.
- C. Section 01 6000 Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 07 9200 Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings.
 - 2. Interior adhesives and sealants, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
 - 7. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings.
 - 2. Interior adhesives and sealants, including flooring adhesives.
 - 3. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.04 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 D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. CAL (CDPH SM) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.1, 2010.
- D. CARB (ATCM) Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board; current edition.
- E. CARB (SCM) Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.
- F. CHPS (HPPD) High Performance Products Database; Current Edition at www.chps.net/.
- G. CRI (GLP) Green Label Plus Testing Program Certified Products; www.carpet-rug.org; current edition.
- H. SCAQMD 1113 South Coast Air Quality Management District Rule No.1113; current edition.
- I. SCAQMD 1168 South Coast Air Quality Management District Rule No.1168; current edition.
- J. SCS (CPD) SCS Certified Products; current listings at www.scscertified.com.
- K. UL (GGG) GREENGUARD Gold Certified Products; current listings at http://http://productguide.ulenvironment.com/QuickSearch.aspx.

1.05 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1. Wet-Applied Products: State amount applied in mass per surface area.
 - 2. Paints and Coatings: Test tinted products, not just tinting bases.
 - 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.
 - 4. Product data submittal showing VOC content is NOT acceptable evidence.
 - 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.

- 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
 - 1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 - 2. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Joint Sealants: SCAQMD 1168 Rule.
 - 3. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 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. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 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 5100 Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- D. Section 01 5713 Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.
- E. Section 01 7800 Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
- F. Section 07 8400 Firestopping.

1.03 QUALIFICATIONS

A. For survey work, employ a land surveyor registered 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.

1.04 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. 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.

- F. 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. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- G. 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.

1.05 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 accommodating items installed later.
- 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

2.01 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

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- 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 mis-fabrication.
- 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.

3.02 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.

3.03 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.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. 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; and _____.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations, and ______.

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- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 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.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. 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-conforming work.
- C. 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.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. 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.
- I. Patching:
 - 1. 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.
 - 2. Match color, texture, and appearance.
 - 3. 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.

3.07 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.

3.08 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. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

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3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. 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.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and_____.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of 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. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- 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.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 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 shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all 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.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 5000 Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 6000 Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 7000 Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 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.

1.04 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 3 EXECUTION

2.01 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.

2.02 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. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site 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. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.

- 3. 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.

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. 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 two sets of revised final documents in final form within 10 days after final inspection.
- C. 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.

PART 3 EXECUTION

2.01 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. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

2.02 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.

2.03 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. 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.
- D. 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.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

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I. Additional Requirements: As specified in individual product specification sections.

2.04 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.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. 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.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor, and subcontractors, with names of responsible parties.
- F. 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.
- G. 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.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

2.05 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.

SECTION 03 300 - 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. Slabs-on-grade.
- B. Related Sections include the following:
 - 1. Section 02 3000 "Earth Work" for drainage fill under slabs-on-grade.
 - 2. Section 02 7510 for concrete pavement and walks.
 - 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.
- 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 filed experience method.
 - i. Material certifications (materials shall meet the requirements of section 2.5 below)
 - 1) Cementitious materials.
 - 2) Admixtures.
 - 3) Aggregates
 - 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. 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, and supports for concrete reinforcement.
- E. 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.
- F. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions for waterstops, vapor retarder and other products indicated by Architect.
- G. Welding certificates.
- H. Qualification Dpata: For Installer, manufacturer and testing agency.
- I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

- 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.

- 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 relive 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.

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. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, ASTM A 767/A 767M, Class I zinc coated after fabrication and bending.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.
- D. Plain-Steel Wire: ASTM A 82, as drawn.
- E. Deformed-Steel Wire: ASTM A 496.
- F. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- G. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- B. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
- C. 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 epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

b.

- 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.
 - 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.
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).
 - 1. Available Products:
 - a. Greenstreak; Swellstop.
 - b. Henry Company, Sealants Division; Hydro-Flex.
 - c. TCMiraDRI; Mirastop.

2.8 VAPOR RETARDERS

- A. Underslab Vapor Barrier 1: 15 mil minimum thickness, Multi-layer, fabric-, cord-, grid-, or aluminumreinforced, 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 ; <u>www.stegoindustries.com</u>
 - 3. Other Acceptable products
 - a. Fortifiber Building Systems Group Product Moistop Ultra® 15; <u>www.fortifiber.com</u>.
 - b. Reef Industries Product Griffolyn 15 Mil ; <u>www.reefindustries.com</u>.
 - c. W.R. Meadows Inc. Product PERMINATOR 15 ; <u>www.wrmeadows.com</u>.
 - 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 siliconate 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.

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.
- I. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
- m. Tamms Industries, Inc.; Horncure WB 30.
- n. Unitex; Hydro Cure 309.
- o. US Mix Products Company; US Spec Maxcure Resin Clear.
- 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.
 - I. 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.
- I. 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.
 - 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.
 - I. 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.
 - I. Unitex; Hydro Seal 25.
 - m. US Mix Products Company; US Spec Radiance UV-25.

n. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

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.
 - 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 70 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.
 - 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.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

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.
- 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.

- 3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 3/16 inch (4.8 mm).
- 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. Castin 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.
 - 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 onehalf 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.
 - 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.
- B. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. 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.
- D. 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.
 - 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.
- 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.
- 15. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.
- E. 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.

MIX DESIGN			
Included?	Description	Location in project documentation	
	199	where this requirement is located.	
	Field data or trial mixture strength data	Spec Section 03300, Part I, Subsection 1.4	
	Verify Mix Design Constraints	Spec Section 03300, Part	
	Limit Fly Ash to 25%	II, Subsection 2.5	
	Limit Proportions per Spec Section 03300, Part	13	
	II, Subsection 2.5	General Notes – Section 4.0	
	W/C ratio, Air, Slump per General Notes		
	Mix Design Data:	Spec Section 03300, Part I, Subsection	
	1. Proportions of cement, fine and coarse aggregate and water.	1.4	
	2. Water/cement ratio, design strength, slump and	Spec Section 03300, Part I, Subsection	
	air content.	2.5, 2.6	
	3. Type of cement and aggregates.	*	
	4. Type and dosage of all admixtures.		
	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.		
REBAR SHOP DRAWINGS			
Included?	Description	Location in project documentation where this requirement is located.	
	Submit all shop drawings on one reproducible print	General Notes - Section 2.0	
	and two reproductions only.	Spec Section 03300, Part I, Subsection	
	-	1.4	
	Contract documents not used for shop drawing.	Spec Section 03300, Part I, Subsection	
		1.4	
	Resubmitted shop drawings have all revised items	Spec Section 03300, Part I, Subsection	
	clouded or identified.	1.4	
	Any requested information, clarifications, requests	Spec Section 03300, Part I, Subsection	
	tor approvals, modifications, etc. as listed in Spec	1.4	
	Section 03300, Part I, Subsection 1.4 are included		
	by the contractor below.		

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FORMWORK, RE-SHORE, OTHER SHOP DRAWINGS			
Included?	Description	Location in project documentation	
		where this requirement is located.	
	Submit all shop drawings on one reproducible print	General Notes - Section 2.0	
	and two reproductions only.	Spec Section 03300, Part I, Subsection	
		1.4	
	Contract documents not used for shop drawing,	Spec Section 03300, Part I, Subsection	
	including erection plans or details	1.4	
	Resubmitted shop drawings have all revised items	Spec Section 03300, Part I, Subsection	
	clouded or identified.	1.4	
	Any requested information, clarifications, requests	Spec Section 03300, Part I, Subsection	
	for approvals, modifications, etc. as listed in Spec	1.4	
	Section 03300, Part I, Subsection 1.4 are included		
	by the contractor below.	Spen Section 02200 Det I Select	
	Calculations stamped by an Engineer registered in	Spec Section 03300, Part I, Subsection	
	TIONS ETC DED SECTION 02200 1	1.4 DADT L CUDEECTION 1.4	
QUESTIONS, ETC. PER SECTION 03300, PART I, SUBSECTION 1.4			

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END OF SECTION 03 3000

SECTION 042000 UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Hollow brick.
- D. Mortar and grout.
- E. Reinforcement and anchorage.
- F. Flashings.
- G. Lintels.
- H. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 031000 Concrete Forming and Accessories: Dovetail slots for masonry anchors.
- B. Section 032000 Concrete Reinforcing: Reinforcing steel for grouted masonry.
- C. Section 033000 Cast-in-Place Concrete: Installation of dovetail slots for masonry anchors.
- D. Section 040100 Maintenance of Masonry.
- E. Section 061000 Rough Carpentry: Nailing strips built into masonry.
- F. Section 071113 Bituminous Dampproofing: Dampproofing parged masonry surfaces.
- G. Section 072500 Weather Barriers: Water-resistive barriers applied to exterior face of backing sheathing or unit masonry substrate.
- H. Section 076200 Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- I. Section 079200 Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A240/A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.
- C. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- D. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- 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 C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale); 2023.
- H. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- I. ASTM C91/C91M Standard Specification for Masonry Cement; 2023.
- J. ASTM C129 Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

- K. ASTM C140/C140M Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.
- L. ASTM C144 Standard Specification for Aggregate for Masonry Mortar; 2018.
- M. ASTM C150/C150M Standard Specification for Portland Cement; 2022.
- N. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- O. ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.
- P. ASTM C270 Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- Q. ASTM C404 Standard Specification for Aggregates for Masonry Grout; 2018.
- R. ASTM C476 Standard Specification for Grout for Masonry; 2023.
- S. ASTM C780 Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.
- T. ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- U. ASTM C1283 Standard Practice for Installing Clay Flue Lining; 2015 (Reapproved 2021).
- V. ASTM C1714/C1714M Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- W. ASTM D4637/D4637M Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).
- X. ASTM E514/E514M Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.
- Y. BIA Technical Notes No. 7 Water Penetration Resistance Design and Detailing; 2017.
- Z. BIA Technical Notes No. 13 Ceramic Glazed Brick Exterior Walls; 2017.
- AA. BIA Technical Notes No. 28B Brick Veneer/Steel Stud Walls; 2005.
- BB. TMS 402/602 Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.
- CC. UL (FRD) Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
 - 1. Include the design engineer's stamp or seal on each sheet of shop drawings.
- D. Samples: Submit _____ samples of facing brick units to illustrate color, texture, and extremes of color range.
- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- F. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.
- G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

1.06 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 (FRD) Assembly No.
- C. 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.
- D. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- E. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 4 feet (m) long by 4 feet (m) high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) and rowlock in mock-up.
- B. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING

Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) 1. and nominal depth of 8 inches (200 mm).
 - 2. Special Shapes: Provide nonstandard blocks configured for corners.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and texture where indicated.
 - Nonloadbearing Units: ASTM C129. 4.
 - a. Hollow block, as indicated.
 - b. Lightweight.

2.02 BRICK UNITS

- A. Manufacturers:
 - 1.
 - Belden Brick; _____: www.beldenbrick.com/#sle. General Shale Brick; ____: www.generalshale.com/#sle. 2.
 - 3. Meridian Brick LLC; Athens Architectural Series: www.meridianbrick.com/#sle.
 - 4. Cherokee. Brick; www.cherokeebrick.com
 - Substitutions: See section 016000 Product Requirements. 5.
- B. Facing Brick: ASTM C216, Type Velour, Grade MW.
 - 1. Nominal size: As indicated on drawings.
 - Special shapes: Molded units as required by conditions indicated, unless standard units 2. can be sawn to produce equivalent effect.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.

- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
 - 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. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): From manufacturer's full range..
 - 2. Color(s): As selected by Architect from manufacturer's full range.
 - 3. Manufacturers:
 - a. Davis Colors, a division of Venator Materials PLC; _____: www.daviscolors.com/#sle.
 - b. Lambert Corporation; _____: www.lambertusa.com/#sle.
 - c. Solomon Colors, Inc; _____: www.solomoncolors.com/#sle.
 - d. Substitutions: See Section 016000 Product Requirements.
- G. Water: Clean and potable.
- H. Accelerating Admixture: Nonchloride type for use in cold weather.
- I. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
- J. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.
- K. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and 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: Mineral pigments added as required to produce approved color sample.
 - 3. Water-repellent mortar for use with water repellent masonry units.

2.04 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
 - 2. WIRE-BOND; ____: www.wirebond.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed billet bars; galvanized.
- 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.
 - Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class
 3.

- E. Strap Anchors: Bent steel shapes, 1-1/2 inch (38 mm) width, 0.105 inch (2.7 mm) thick, 24 inch (610 mm) length, with 1-1/2 inch (38 mm) 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 (16 mm) of mortar coverage from masonry face.
- G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

2.05 FLASHINGS

- A. Metal Flashing Materials: Stainless Steel, as specified in Section 076200.
- B. Membrane Non-Asphaltic Flashing Materials:
 - 1. Composite Polymer Flashings Self-Adhering: Composite polyethylene; 40 mil (1.0 mm) thick with pressure-sensitive butyl adhesive and release paper.
 - 2. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch (1.0 mm) thick.
 - a. Manufacturers:
 - 1) Hohmann & Barnard, Inc; ____: www.h-b.com/#sle.
 - 2) Substitutions: See Section 016000 Product Requirements.
- C. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc; ____: www.h-b.com/#sle.
 - b. York Manufacturing, Inc; ____: www.yorkmfg.com/#sle.
 - c. Substitutions: See Section 016000 Product Requirements.
- D. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
 - 1. Manufacturers, Synthetic Rubber Products:
 - a. Mortar Net Solutions; BTL-1 Butyl Sealant: www.mortarnet.com/#sle.
 - b. Substitutions: See Section 016000 Product Requirements.
 - 2. Manufacturers, Modified Polyether Products:
 - a. Mortar Net Solutions; ____: www.mortarnet.com/#sle.
 - b. York Manufacturing, Inc; UniverSeal US-100 Liquid Tape: www.yorkmfg.com/#sle.
 - c. Substitutions: See Section 016000 Product Requirements.
- E. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc; ____: www.h-b.com/#sle.
 - b. Substitutions: See Section 016000 Product Requirements.
- F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

- A. Preformed Control Joints: Neoprene material. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Blok-Lok Limited; _____: www.blok-lok.com/#sle.

- b. Hohmann & Barnard, Inc; ____: www.h-b.com/#sle.
- c. WIRE-BOND; ____: www.wirebond.com/#sle.
- d. Substitutions: See Section 016000 Product Requirements.
- 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.
 - b. WIRE-BOND; ____: www.wirebond.com/#sle.
 - c. Substitutions: See Section 016000 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. Full-Height Airspace Maintenance and Drainage Material: Mesh panels fitted between masonry ties.
 - 2. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.
 - 2) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
 - 3) York Manufacturing, Inc; ____: www.yorkmfg.com/#sle.
 - 4) Substitutions: See Section 016000 Product Requirements.
- D. Weeps:
 - 1. Type: Polyester mesh.
 - 2. Color(s): From manufacturer's full range..
 - 3. Manufacturers:
 - a. Blok-Lok Limited; ____: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc; : www.h-b.com/#sle.
 - c. WIRE-BOND; : www.wirebond.com/#sle.
 - d. Substitutions: See Section 016000 Product Requirements.
- E. Cavity Vents:
 - 1. Manufacturers:
 - a. Blok-Lok Limited; _____: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
 - c. WIRE-BOND; ____: www.wirebond.com/#sle.
 - d. Substitutions: See Section 016000 Product Requirements.
- F. Chimney Cap: Precast concrete, sized to cover chimney construction plus additional overhang for drip on four sides, thickness as indicated, sloped from flue opening to edges for natural drainage.
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 LINTELS

- A. Prefabricated Steel Lintels:
 - 1. Manufacturers:
 - a. FERO Corporation; FERO Engineered Concealed Lintel Systems: www.ferocorp.com/#sle.
 - b. Hohmann & Barnard, Inc; Engineered Concealed Lintel Systems: www.h-b.com/#sle.
 - c. Substitutions: See Section 016000 Product Requirements.

2.08 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 S.
- 2. Exterior, loadbearing masonry: Type N.
- 3. Exterior, non-loadbearing masonry: Type N.
- 4. Interior, loadbearing masonry: Type N.
- 5. Interior, non-loadbearing masonry: Type O.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

3.03 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 (5 degrees C) prior to, during, and 48 hours after completion of masonry work.
- C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

3.04 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 (200 mm).
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.05 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. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
- L. Lay clay tile flue linings vertically, embedded in concrete block units.
 - 1. Install in accordance with ASTM C1283.
 - 2. Extend above chimney cladding 8 inches (203 mm).
 - 3. Trowel mortar smooth over chimney cladding and slope for positive drainage.
- M. Place precast chimney cap atop chimney masonry; mortar into place; seal to protruding flue.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches (600 mm) 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, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Lap joint reinforcement ends minimum 6 inches (150 mm).
- D. 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 (900 mm) horizontally and 24 inches (600 mm) vertically.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches (400 mm) on center vertically and 36 inches (900 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

3.10 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 (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 1 inch (25.4 mm), minimum, to form watertight pan at nonmasonry construction.

- B. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- D. Extend metal flashings to within 1/2 inch (12 mm) of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.
- E. Extend plastic, laminated, EPDM, and _____ flashings to within 1/2 inch (12 mm) of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.11 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Openings to 42 inches (1070 mm): Place two, No. 3 (M9) reinforcing bars 1 inch (25 mm) from bottom web.
 - 2. Openings from 42 inches (1070 mm) to 78 inches (1980 mm): Place two, No. 5 (M16) reinforcing bars 1 inch (25 mm) from bottom web.
 - 3. Openings over 78 inches (1980 mm): Reinforce openings as detailed.
 - 4. Do not splice reinforcing bars.
 - 5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
 - 6. Place and consolidate grout fill without displacing reinforcing.
 - 7. Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 6 inch (_____ mm) bearing on each side of opening.

3.12 GROUTED COMPONENTS

- A. Reinforce bond beams with 2, No.5 minimum bars, 1 inch (25 mm) from bottom web.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.

3.13 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.14 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).
- C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- E. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.15 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.16 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.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 1200 - 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.

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, 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 on three copies only unless specified otherwise in the general conditions. Two prints will be returned to the architect. All copies required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
- 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, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
- 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
- 3. Contract documents shall not be used for shop drawing, including erection plans or details.
- 4. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
- 5. All structural steel connections not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor.
- 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. 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.
- G. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
- H. 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 slipcritical-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% y 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 contaminates, 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 Mils 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 Tnemec 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 05 1200.

SECTION 05 3100 - STEEL 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. 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 on three copies only unless specified otherwise in the general conditions. Two prints will be returned to the architect. All copies required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
- 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."
- 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. Bowman Metal Deck Div., Cyclops Corp.
 - 2. Consolidated Systems, Inc.
 - 3. Epic Metals Corp.
 - 4. Marlyn Steel Products, Inc.
 - 5. H. H. Robertson Co.
 - 6. Roll Form Products, Inc.
 - 7. Roof Deck, Inc.
 - 8. United Steel Deck, Inc.
 - 9. Vulcraft Div., Nucor Corp.
 - 10. Wheeling Corrugating Co.

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

C. 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: **As indicated**
- 4. Design Uncoated-Steel Thickness: As Indicated
- 5. Span Condition: As indicated.
- D. NONCOMPOSITE FORM DECK.
 - 1. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form 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: **9/16 inch**.
 - 4. Design Uncoated-Steel Thickness: 26 ga
 - 5. Span Condition: **Triple span or more**.
 - 6. Side Laps: **Overlapped or interlocking seam at Contractor's option**.

.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 by puddle welds:
 - 1. Anchor Diameter: 5/8" puddle welds.
 - 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: **5/8 inch**, nominal.
 - 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.
 - 3. Weld Washers: Install weld washers at each weld location for decking thinner than 22 ga.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels 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.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 3 **inches** with end 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 05 3100

SECTION 05 4000 - 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 the following:
 - 1. Exterior load-bearing wall framing.
 - 2. Interior load-bearing wall framing.
 - 3. Exterior non-load-bearing wall 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, rafters and incidental framing for a cold formed metal framing assembly within the extent shown on the drawings.

1.3 REFERENCES

- A. ASTM A 780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- B. ASTM A 1003 Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- C. ASTM B 633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- D. ASTM C 955 Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

- E. ASTM C 1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- F. ASTM C1007 Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- G. ASTM C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- H. AISC Steel Construction Manual.
- I. AISI Specification for the Design of Cold-Formed Steel Structural Members; 1996.
- J. AWS D.1.3 Structural Welding Code Sheet Steel.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 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. Engineering cost to be borne by Manufacturer.
 - 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 indicated in General Notes and Typical Details.
 - 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. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
 - c. Roof Rafter Framing: Horizontal deflection of 1/240 of the horizontally projected span.
 - 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 120 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.

1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses 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, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 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. 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. Submit design analysis and test reports indicating loading, section properties, allowable stress, stress diagrams and calculations, and similar information needed for analysis and to insure trusses comply with requirements.
 - 5. 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.
 - 6. Submittals shall additionally conform to the requirements shown on the General Notes of the project Structural Drawings.
 - 7. Submit wall panel drawings for pre-fabricated panels showing panel layout, elevation, material and location. Where prefabricated panels are to be provided, provide drawings depicting panel configurations, dimensions and locations.
- C. Welding certificates.
- D. Qualification Data: For professional engineer including Proof of professional liability insurance for Professional engineer.
- E. 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.
- F. Research/Evaluation Reports: For cold-formed metal framing.

1.6 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, 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. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. 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."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 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.
- 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.

1.8 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 coldformed metal framing that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. Allied Studco.
 - 2. AllSteel Products, Inc.
 - 3. California Expanded Metal Products Company.
 - 4. Clark Steel Framing.
 - 5. Consolidated Fabricators Corp.; Building Products Division.
 - 6. Craco Metals Manufacturing, LLC.
 - 7. Custom Stud, Inc.
 - 8. Dale/Incor.
 - 9. Design Shapes in Steel.
 - 10. Dietrich Metal Framing; a Worthington Industries Company.
 - 11. Formetal Co. Inc. (The).
 - 12. Innovative Steel Systems.
 - 13. MarinoWare; a division of Ware Industries.
 - 14. Quail Run Building Materials, Inc.
 - 15. SCAFCO Corporation.
 - 16. Southeastern Stud & Components, Inc.
 - 17. Steel Construction Systems.
 - 18. Steeler, Inc.
 - 19. Super Stud Building Products, Inc.
 - 20. United Metal Products, Inc.
 - 21. Aegis Metal Framing, a division of MiTek
 - 22. The Steel Network, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).
- C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G90 (Z275), complying with ASTM C 955.

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as indicated in contract drawings.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as indicated in contract drawings.
- 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 indicated in contract drawings.

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 required.
- B. Vertical Deflection Clips: Manufacturer's standard 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.
- C. 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 required.
- D. 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 required to meet the design loads.
- 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 joist track, with unstiffened flanges; unpunched; of web depths indicated; and as required to meet the design loads.

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. Joist 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. 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.
- C. 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.
- D. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

- 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.
- 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.

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 joist 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 joist 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", manufacturer's written instructions and ASTM C1007 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, trueto-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 joists, 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.

3.4 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 indicated in general notes.

- 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: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- E. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- F. 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.
- G. 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.
- H. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. 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.
- I. 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.
- J. 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 bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated.
- 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 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 indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches (450 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 centers indicated on Shop Drawings.
 - 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.

3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).

- 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:
 - 1. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joisttrack solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-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 05 4000
SECTION 05 5100 METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.
- B. Section 033000 Cast-in-Place Concrete: Placement of metal anchors in concrete.
- C. Section 042000 Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

- A. AISC 201 AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- B. ASTM A6/A6M Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2023.
- C. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- E. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- F. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- G. ASTM A283/A283M Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- H. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- 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 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; 2023.
- L. 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.
- M. 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; 2023.
- N. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- O. AWS B2.1/B2.1M Specification for Welding Procedure and Performance Qualification; 2021.

- P. AWS D1.1/D1.1M Structural Welding Code Steel; 2020, with Errata (2023).
- Q. ICC (IBC) International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- R. NAAMM AMP 510 Metal Stairs Manual; 1992.
- 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 SUBMITTALS

- A. See Section 013000 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.
- C. Design Data: As required by authorities having jurisdiction.
- D. Design Data, Seismic Performance: Submit documentation that stairs meet performance requirements specified.
- E. 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.
- F. Designer's Qualification Statement.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Alabama, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.
- C. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Prefabricated Metal Stairs:
 - 1. Cutting Edge Steel; Cutting Edge Stair: www.cesteel.com/#sle.
 - 2. Precision Ladders, LLC; Aluminum Alternating Tread Stairs: www.precisionladders.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.

2.02 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. Handrails: Comply with applicable accessibility requirements of ADA Standards.
- 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
- 4. Dimensions: As indicated on drawings.
- 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
- 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
- 7. 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.
 - 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. Industrial: All joints made neatly.
 - a. Welded Joints: Welded on back side wherever possible.
 - b. Welds Exposed to Touch: Ground smooth.
 - c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.
- 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.

2.03 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Industrial, as defined above.
- B. Risers: Open.
- C. Treads: Metal pan with field-installed concrete fill.
 - 1. Concrete Depth: 1-1/2 inches (38 mm), minimum.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
 - 4. Concrete Reinforcement: Welded wire mesh.
 - 5. Concrete Finish: Steel troweled.
- D. Stringers: Rolled steel channels.
 - 1. Stringer Depth: 10 inches (250 mm).
 - 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 picket railings.
- G. Finish: Shop- or factory-prime painted.
- H. Finish: Galvanized after fabrication, except sheet components to be galvanized before fabrication.
- I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.04 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 - 1. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
- B. Guards:

- 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum. Infill at Picket Railings: Vertical pickets.
 - a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
 - b. Material: Solid steel bar.
 - c. Shape: Round.
 - d. Size: 1/2 inch (13 mm) square.
 - e. Top Mounting: Welded to underside of top rail.
 - f. Bottom Mounting: Welded to top surface of stringer.
- 3. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.05 MATERIALS

2

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- E. 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).
- F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.
- G. Concrete Fill: Portland cement Type I, 3000 psi (20 MPa) 28 day strength, 2 to 3 inch (51 to 76 mm) slump.
- H. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.06 ACCESSORIES

1.

- A. Factory Fabricated Stair Tread and Nosing:
 - Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
 - a. Tread Abrasive Filler: Virgin grain aluminum oxide epoxy-bonded to tread base.
 - b. Tread Type: Ribbed bar.
 - c. Nosing Types: Long nose for steel pan stairs.
 - d. Color: Black.
- 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.
- 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.

2.07 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 A123/A123M.
 - 1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 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.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- 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.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

SECTION 055213 PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 042000 Unit Masonry: Placement of anchors in masonry.
- C. Section 055100 Metal Stairs: Handrails other than those specified in this section.
- D. Section 099113 Exterior Painting: Paint finish.
- E. Section 099123 Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. AISC 201 AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- C. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- D. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- E. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- F. ASTM E935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- G. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- H. AWS B2.1/B2.1M Specification for Welding Procedure and Performance Qualification; 2021.
- I. AWS D1.1/D1.1M Structural Welding Code Steel; 2020, with Errata (2023).
- J. AWS D1.6/D1.6M Structural Welding Code Stainless Steel; 2017, with Amendment (2021).
- K. AWS C3.4M/C3.4 Specification for Torch Brazing; 2016.
- L. AWS C3.5M/C3.5 Specification for Induction Brazing; 2016, with Amendment (2017).
- M. AWS C3.9M/C3.9 Specification for Resistance Brazing; 2020.
- N. SSPC-Paint 15 Steel Joist Shop Primer/Metal Building Primer; 2004.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, 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.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Alabama, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.
- C. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
 - 2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Handrails and Railings:
 - 1. White Fab
 - 2. US Steel
 - 3. Hanna
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Allow for expansion and contraction of members and building movement without damage to connections or members.
- D. Dimensions: See drawings for configurations and heights.
- 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.
- F. Provide slip-on non-weld mechanical 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.
- G. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - 1. Ease exposed edges to a small uniform radius.
 - 2. Welded Joints:
 - a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
 - b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
 - 3. Brass/Bronze Brazed Joints:
 - a. Perform torch brazing in accordance with AWS C3.4M/C3.4.
 - b. Perform induction brazing in accordance with AWS C3.5M/C 3.5.
 - c. Perform resistance brazing in accordance with AWS C3.9M/C3.9.

2.03 STEEL RAILING SYSTEM

- A. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- B. Exposed Fasteners: No exposed bolts or screws.

2.04 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 intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. 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. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections, and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 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.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

SECTION 055000 METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.
- B. Downspout boots.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 042000 Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 055213 Pipe and Tube Railings.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A48/A48M Standard Specification for Gray Iron Castings; 2022.
- 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; 2023.
- F. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- G. AWS B2.1/B2.1M Specification for Welding Procedure and Performance Qualification; 2021.
- H. AWS D1.1/D1.1M Structural Welding Code Steel; 2020, with Errata (2023).
- I. AWS D1.2/D1.2M Structural Welding Code Aluminum; 2014, with Errata (2020).
- J. IAS AC172 Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- K. SSPC-Paint 15 Steel Joist Shop Primer/Metal Building Primer; 2004.
- L. SSPC-Paint 20 Zinc-Rich Coating (Type I Inorganic, and Type II Organic); 2019.

1.04 SUBMITTALS

- A. See Section 013000 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.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
- 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. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 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. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 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. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- B. Lintels: As detailed; prime paint finish.

2.04 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.
 - 2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
 - 3. Finish: Manufacturer's standard factory applied primer finish.
 - 4. Color: To be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 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.

SECTION 061000 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preservative treated wood materials.
- B. Fire retardant treated wood materials.
- C. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 051200 Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
- C. Section 055000 Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- D. Section 072500 Weather Barriers: Water-resistive barrier over sheathing.
- E. Section 072700 Air Barriers: Air barrier over sheathing.
- F. Section 076200 Sheet Metal Flashing and Trim: Sill flashings.
- G. Section 092116 Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- D. AWPA U1 Use Category System: User Specification for Treated Wood; 2023.
- E. ICC (IBC) International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. ICC-ES AC38 Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).
- G. ICC-ES AC380 Acceptance Criteria for Termite Physical Barrier Systems; 2021, with Editorial Revision (2022).
- H. PS 1 Structural Plywood; 2023.
- I. PS 20 American Softwood Lumber Standard; 2021.

1.04 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.

1.05 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. 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.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 - 3. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.
- C. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
 - 1. Thickness: 68 mil, 0.068 inch (1.7 mm).
 - 2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
- D. Sill Flashing: See Section 076200.
- E. Water-Resistive Barrier: Plastic sheet complying with ICC-ES AC38.
- F. Air Barrier: See Section 072700.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA 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.
- B. Fire Retardant Treatment:
 - 1. Products:
 - a. Lonza Group; ____: www.wolmanizedwood.com/#sle.
 - b. Hoover Treated Wood Products, Inc; ____: www.frtw.com/#sle.
 - c. Koppers, Inc; ____: www.koppersperformancechemicals.com/#sle.
 - d. Substitutions: See Section 016000 Product Requirements.
 - 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. Treat rough carpentry items as indicated .
- c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.

3.02 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.

3.03 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.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) 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: 48 by 96 inches (2440 by 4880 mm), installed horizontally at ceiling height.

3.05 TOLERANCES

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 CLEANING

- A. Waste Disposal: See Section 017419 Construction Waste Management and Disposal.
 - 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.

SECTION 062000 FINISH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings.

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 061000 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.

1.03 REFERENCE STANDARDS

- A. AWI (QCP) Quality Certification Program; Current Edition.
- B. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) North American Architectural Woodwork Standards; 2021, with Errata.
- D. HPVA HP-1 American National Standard for Hardwood and Decorative Plywood; 2020.
- E. NEMA LD 3 High-Pressure Decorative Laminates; 2005.
- F. WI (CCP) Certified Compliance Program (CCP); Current Edition.
- G. WI (MCP) Monitored Compliance Program (MCP); Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 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 (125 mm to 1 m), minimum.
 - 2. Include certification program label.
- D. Samples: Submit one sample of lumber or finish plywood, 12 by 12 inch (____by___ mm) 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 (____ mm) long.

1.05 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.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- C. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - 2. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.

- 3. Provide designated labels on shop drawings as required by certification program.
- 4. Provide designated labels on installed products as required by certification program.
- 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.
- B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- C. Protect from moisture damage.
- D. Handle materials and products to prevent damage to edges, ends, or surfaces.

1.08 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

2.01 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.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.02 SUSTAINABILITY CHARACTERISTICS

2.03 LUMBER MATERIALS

- A. Softwood Lumber: SYP species, maximum moisture content of 6 percentof 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.

2.04 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.

2.05 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: See Finish Legend.

2.06 ADHESIVE

A. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.07 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.

2.08 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

2.09 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 minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm 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 (0.79 mm). 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 (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

SECTION 064000 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Laminate covered cabinets.
- B. Wood cabinets, desks, and paneling.
- C. Solid surface countertops, backsplashes and trim, where indicated; and vertical panels, where indicated.
- D. Manufactured quartz solid surface countertop, backsplashes and trim, where indicated; and vertical panels, where indicated.
- E. Closet and utility shelving (paint on site, under Section 09 9100).
- F. 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.
- G. Hardware for architectural woodwork.
- H. Related work and trim for above items.
- I. Extent of each type of architectural woodwork is indicated on drawings and in schedules.
- J. Architectural woodwork and components for opaque finish are intended to be finish painted onsite, under Section 09 9100.
- K. 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.
 - 3. Quartz Solid Surface: Manufacturer's standard samples, approximately 6-inches x 6inches 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.

1.04 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.

1.05 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.

1.06 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

2.01 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. 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.
 - 3. Formica: www.formica.com.
 - 4. Hi Macs: www.lghimacs.com.
 - 5. Wilsonart: www.wilsonart.com. (Basis of Design, Quality and Warranty)

2.02 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.

2.03 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.
- 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.

2.04 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.

2.05 ARCHITECTURAL COUNTER TOPS:

- A. Quality Standard: Comply with AWS, Edition 2 Section 11-Countertops.
- B. 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 Openngs: 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.
 - 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.

2.06 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 cladded interiors for wood cabinets: To match HPDL.

2.07 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 (1.22 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
 - b. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
 - c. Post-Formed Horizontal Surfaces: HGP, 0.039 inch (1.0 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
 - d. Post-Formed Vertical Surfaces: VGP, 0.028 inch (0.71 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
 - e. Flame Retardant Surfaces: HGF, 0.048 inch (1.22 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
 - f. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
 - g. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
- C. Hardboard: AHA A135.4 (tempered).
- D. Melamine cladded interiors in laminate cabinets.
- E. Core Materials:
 - 1. MR Moisture Resistant Medium Density Fiberboard: Average 47-pound density grade, ANSI A208.2.

2.08 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.

2.09 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-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.10 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.

2.11 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.
- 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.

2.12 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.

2.13 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 Knape & 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 5/8inch 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 5disc 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. 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.

3.02 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.
- 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.

3.03 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.

SECTION 070553 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

1.05 FIELD CONDITIONS

- A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.
- B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Partition Identification Labels:
 - 1. Fire Wall Signs, Inc; _____: www.firewallsigns.com/#sle.
 - 2. Safety Supply Warehouse, Inc; _____: www.safetysupplywarehouse.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.

2.02 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
- B. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 099123 for products.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 099123 for substrate preparation for painted markings.

3.03 INSTALLATION

- A. Locate markings as required by ICC (IBC).
- B. Install applied markings in accordance with Section 099123.
- C. Install neatly, with horizontal edges level.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

SECTION 072100 THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation and integral vapor retarder at cavity wall construction, over roof deck, and exterior wall behind brick wall finish.
- B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

1.03 REFERENCE STANDARDS

- A. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- B. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- C. ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- E. ASTM E136 Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.
- F. ASTM E2357 Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2023a.
- G. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Include information on installation techniques.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation Inside Masonry Cavity Walls: Expanded polystyrene (EPS) board.
- B. Insulation Inside Prefabricated Wall Panels: Extruded polystyrene (XPS) board.
- C. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- D. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.
- E. Insulation over Roof Deck: Vacuum insulated panel (VIP) board.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
 - 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. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 4. Board Edges: Square.
 - 5. Water Absorption, Maximum: 0.3 percent by volume.
 - 6. Type and Thermal Resistance, R-value (RSI-value): Type XI, 3.1 (0.55), minimum, per 1 inch (25.4 mm) thickness at 72 degrees F: 5, minimum.
 - 7. Products:
 - a. Atlas Molded Products, a Division of Atlas Roofing Corporation; ThermalStar EPS Wall Insulation Board: www.atlasmoldedproducts.com/#sle. If white, and if behind acoustic metal panels in gymnasium space, cover with black (4 mil) poly sheeting.
 - b. DuPont; STYROFOAM BRAN ULTRA SL XPS; www.dupont.com
 - c. Substitutions: See Section 016000 Product Requirements.
- B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 - 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 (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
 - 4. Board Edges: Square.
 - 5. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
 - 6. Products:
 - a. DuPont de Nemours, Inc; Styrofoam Brand _____: building.dupont.com/#sle.
 - b. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
 - c. Owens Corning Corporation; FOAMULAR Type ____ Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
 - d. Substitutions: See Section 016000 Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

2.04 ACCESSORIES

- A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch (0.25 mm) thick.
- B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
 - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
 - 2. Width: Are required for application.
- C. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
 - 1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
 - 2. Thickness: 45 mil, 0.045 inch (1.14 mm), nominal.
 - 3. Size: 6 inches (152 mm) wide, in rolls 75 feet (23 m) long.
- D. Flashing Tape: Special reinforced film with high performance adhesive.
 - 1. Application: Window and door opening flashing tape.
 - 2. Width: As required for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Adhere 6 inches (152 mm) wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
 - 1. Tape seal joints between sheets.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

SECTION 072500 WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Water-resistive barrier under exterior cladding.
- B. Section 076200 Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 REFERENCE STANDARDS

- A. AATCC Test Method 127 Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).
- B. ASTM D226/D226M Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- C. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- D. ASTM D779 Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016.
- E. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).
- F. ASTM D1970/D1970M Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- G. ASTM E2357 Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2023a.
- H. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- I. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- J. ASTM E2178 Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- K. ICC-ES AC38 Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).
- L. ICC-ES AC212 Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015, with Editorial Revision (2020).
- M. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIER MATERIALS

- A. Water-Resistive Barrier: For use in Construction Types I, II, III, and IV on buildings greater than 40 feet (12.2 m) in height.
 - 1. Comply with NFPA 285 wall assembly requirements in accordance with local building code and authorities having jurisdiction (AHJ).
- B. Asphalt Felt: ASTM D226/D226M, Type I, No.15 asphalt felt.
- C. Building Paper: Asphalt-saturated kraft Grade D type sheathing paper complying with ICC-ES AC38.
 - 1. Water Resistance: At least 60 minutes when tested in accordance with ASTM D779.
 - Water Vapor Permeance: 29 perms (1,658 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F (23 degrees C).
 - 3. Products:
 - a. Henry Company; Super Jumbo Tex 60 Minute: www.henry.com/#sle.
 - b. Substitutions: See Section 016000 Product Requirements.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm) nominal thickness.
 - 2. Color: Green.
 - 3. Elongation: 1,300 percent, measured in accordance with ASTM D412.
 - 4. Peel Adhesion: 28 lb/inch (5.0 kg/cm), minimum, when tested in accordance with ASTM D903.
- C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
 - 1. Width: 4 inches (102 mm).
 - 2. Products:
 - a. DuPont de Nemours, Inc; FlexWrap: www.dupont.com/building/#sle.
 - b. Henry Company; FortiFlash: www.henry.com/#sle.
 - c. SIGA Cover Inc; SIGA-Wigluv: www.siga.swiss/global en/#sle.
 - d. Substitutions: See Section 016000 Product Requirements.
- D. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
 - 1. Width: 3-1/2 inches (89 mm).
 - 2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Mechanically Fastened Exterior Sheets:
 - 1. Install sheets shingle-fashion to shed water, with seams aligned horizontal.
 - 2. Overlap seams as recommended by manufacturer, 6 inches (152 mm), minimum.
 - 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches (305 mm), minimum.
 - 4. Install water-resistive barrier over jamb flashings.
 - 5. Install head flashings under water-resistive barrier.
 - 6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- D. Openings and Penetrations in Exterior Water-Resistive Barriers:
 - 1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto water-resistive barrier and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches (50 mm) beyond face of jambs; seal water-resistive barrier to flashing.
 - 5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 PROTECTION

A. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

SECTION 072700 AIR BARRIERS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Air barrier under exterior cladding.
- B. Section 076200 Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with air barriers.
- C. Section 092116 Gypsum Board Assemblies: Air barrier under exterior cladding.

1.02 REFERENCE STANDARDS

- A. AATCC Test Method 127 Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).
- B. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- C. ASTM C1177/C1177M Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.
- D. ASTM D1970/D1970M Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- E. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- F. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).
- G. ASTM E2178 Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- H. ASTM E2357 Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2023a.
- I. ICC-ES AC148 Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).
- J. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, limitations, and
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

1.04 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
- B. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- D. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier Sheet, Mechanically Fastened:
 - 1. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.
 - Water Vapor Permeance: 10 perms (574 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F (23 degrees C).
 - 3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
 - 4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
 - 5. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2-1/2 inches (64 mm) wide, compatible with sheet material; unless otherwise indicated.
 - 6. Products:
 - a. Carlisle Coatings and Waterproofing, Inc; CCW 705 RS: www.carlisleccw.com/#sle.
 - b. DuPont de Nemours, Inc; Tyvek Construction Wrap with Tyvek Fluid Applied Flashing
 Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap, StraightFlash, VersaFlange, Tyvek Wrap Caps, and Tyvek Tape: building.dupont.com/#sle.
 - c. Henry Company; WeatherSmart: www.henry.com/#sle.
 - d. Hohmann & Barnard, Inc; ____: www.h-b.com/#sle.
 - e. Substitutions: See Section 016000 Product Requirements.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
 - 2. Color: Green.
- C. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.

1. Width: 4 inches (102 mm).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Mechanically Fastened Sheets On Exterior:
 - 1. Install sheets shingle fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer, 6 inches (152 mm), minimum.
 - 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches (305 mm), minimum.
 - 4. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
 - 5. Install air barrier underneath jamb flashings.
 - 6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- E. Openings and Penetrations in Exterior Air Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto air barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under air barrier extending at least 2 inches (50 mm) beyond face of jambs; seal air barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

SECTION 076200 SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, exterior penetrations, _____, and other items indicated in Schedule.
- B. Sealants for joints within sheet metal fabrications.

1.02 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 A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- C. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM B749 Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2020.
- E. ASTM C920 Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM D226/D226M Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- G. ASTM D4586/D4586M Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- H. CDA A4050 Copper in Architecture Handbook; current edition.
- I. SMACNA (ASMM) Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.04 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 _____ years of documented experience.

1.05 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

2.01 MANUFACTURERS

- A. Sheet Metal Flashing and Trim:
 - 1. Petersen Aluminum Corporation; _____: www.pac-clad.com/#sle.
 - 2. Taylor Metal Products; _____: www.taylormetal.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.
- B. Exterior Penetration Flashing Panel:
 - 1. Quickflash Weatherproofing Products, Inc; _____: www.quickflashproducts.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

2.02 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal.
- B. Lead Sheet: ASTM B749, 0.047-inch (1.19 mm) minimum thickness; UNS Number L51121.
- C. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch (0.40 mm) thick; smooth No. 4 Brushed finish.

2.03 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 (13 mm); 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 (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 GUTTERS AND DOWNSPOUTS

- A. Gutters: SMACNA (ASMM) Rectangular profile.
- B. Downspouts: Rectangular profile.
- C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).
- D. Seal metal joints.

2.05 EXTERIOR PENETRATION FLASHING PANELS

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.

2.06 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.
- C. Primer Type: Zinc chromate.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.03 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. Secure gutters and downspouts in place with concealed fasteners.

SECTION 077200 ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof curbs.
- B. Equipment rails.
- C. Roof penetrations mounting curbs.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1926.502 Fall protection systems criteria and practices; Current Edition.
- B. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.
- D. ASTM B69 Standard Specification for Rolled Zinc; 2021.
- E. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- F. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- G. MSS SP-58 Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 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.

1.05 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for _____. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

- A. Roof Curbs Manufacturers:
 - 1. AES Industries Inc; ____: www.aescurb.com/#sle.

- 2. The Pate Company; ____: www.patecurbs.com/#sle.
- 3. LMCurbs; Roof Curbs: www.lmcurbs.com/#sle.
- 4. Substitutions: See Section 016000 Product Requirements.
- B. 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 standing seam metal roof panel system.
 - 2. Sheet Metal Material:
 - a. Aluminum: 0.080 inch (2.03 mm) minimum thickness, with 3003 alloy, and H14 temper.
 - 3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
 - a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.
 - b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
 - c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
 - d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
 - 4. Provide layouts and configurations indicated on drawings.
- C. 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 (38 mm) thick fiberglass insulation.
 - 3. Height Above Finished Roof Surface: 8 inches (203 mm), minimum.
- D. Equipment Support: Straight curbs on each side of equipment, with top of curbs parallel with metal roofing system and each other for equipment mounting.
- E. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches (400 mm) square unless otherwise indicated.

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 methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

SECTION 078400 FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

- A. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- B. ASTM E1966 Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).
- C. ASTM E2174 Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.
- D. ASTM E2393 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- E. ASTM E2837 Standard Test Method for Determining the Fire Resistance of Continuity Headof-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.
- F. ITS (DIR) Directory of Listed Products; Current Edition.
- G. FM 4991 Approval Standard of Firestop Contractors; 2013.
- H. SCAQMD 1168 Adhesive and Sealant Applications; 1989, with Amendment (2022).
- I. UL 1479 Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- J. UL 2079 Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- K. UL (DIR) Online Certifications Directory; Current Edition.
- L. UL (FRD) Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.05 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 the work of this section and:
 1. Verification of minimum three years documented experience installing work of this type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products; ____: www.3m.com/firestop/#sle.
 - 2. MarinoWARE; _____: www.marinoware.com/#sle.
 - 3. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
- C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING SYSTEMS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.03 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

SECTION 079200 JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 016116 Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
- B. Section 092116 Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- C. Section 093000 Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

- A. ASTM C661 Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- C. ASTM C834 Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- D. ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications; 2022.
- E. ASTM C920 Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM C1087 Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
- G. ASTM C1193 Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- H. ASTM C1248 Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- I. ASTM C1311 Standard Specification for Solvent Release Sealants; 2022.
- J. ASTM C1330 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.
- K. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- L. SCAQMD 1168 Adhesive and Sealant Applications; 1989, with Amendment (2022).
- M. UL 263 Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.

- C. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- D. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- Installer Qualifications: Company specializing in performing the work of this section and with at Β. least three years of documented experience.
- C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - Adhesion Testing: In accordance with ASTM C794. 1.
 - Compatibility Testing: In accordance with ASTM C1087. 2.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - Deliver sufficient samples to manufacturer for testing. 4.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

1.06 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- Nonsag Sealants: A.
 - Bostik Inc; ____: www.bostik-us.com/#sle. 1.
 - 2. Dow; ____: www.dow.com/#sle.
 - 3. Henry Company; ____: www.henry.com/#sle.
 - Pecora Corporation; _____: www.pecora.com/#sle. Sika Corporation; _____: www.usa.sika.com/#sle. 4.
 - 5.
 - W.R. Meadows, Inc; : www.wrmeadows.com/#sle. 6.
 - Substitutions: See Section 016000 Product Requirements. 7.
- B. Self-Leveling Sealants:
 - Bostik Inc; ____: www.bostik-us.com/#sle. 1.
 - Dow; ____: www.dow.com/#sle. 2.
 - 3. Pecora Corporation; ____: www.pecora.com/#sle.
 - Sika Corporation; : www.usa.sika.com/#sle. 4.
 - Tremco Commercial Sealants & Waterproofing; : www.tremcosealants.com/#sle. 5.
 - W.R. Meadows, Inc; ____: www.wrmeadows.com/#sle. 6.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Interior Joints:
 - a. Do not seal gaps and openings in gypsum board and suspended ceilings
 - b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - 2. Do Not Seal:

- a. Intentional weep holes in masonry.
- b. Joints indicated to be covered with expansion joint cover assemblies.
- c. Joints where sealant installation is specified in other sections.

2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.
- B. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

- A. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's standard range.
 - 4. Cure Type: Single component, neutral moisture curing.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 Color: White.
- C. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
 - 1. Color: White.

2.05 SELF-LEVELING JOINT SEALANTS

- A. _____ Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
 - 1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
 - 2. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
- B. Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.
 - 1. Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.

2.06 ACCESSORIES

- A. Sealant Backing Rod, Closed-Cell Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
 - 3. Products:
 - a. Nomaco, Inc; HBR: www.nomaco.com/#sle.
 - b. Substitutions: See Section 016000 Product Requirements.
- B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- G. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

SECTION 081113 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 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. Thermally insulated hollow metal doors with frames.
- E. Hollow metal borrowed lites glazing frames.
- F. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED REQUIREMENTS

- A. Section 087100 Door Hardware.
- B. Section 088000 Glazing: Glass for doors and borrowed lites.
- C. Section 099113 Exterior Painting: Field painting.
- D. Section 099123 Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.
- C. ANSI/SDI A250.8 Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- E. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- F. 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; 2023.
- G. 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.
- H. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- I. BHMA A156.115 Hardware Preparation in Steel Doors and Frames; 2016.
- J. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.
- K. ITS (DIR) Directory of Listed Products; Current Edition.
- L. NAAMM HMMA 830 Hardware Selection for Hollow Metal Doors and Frames; 2002.
- M. NAAMM HMMA 831 Hardware Locations for Hollow Metal Doors and Frames; 2011.
- N. NAAMM HMMA 840 Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.
- O. NAAMM HMMA 861 Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- P. NAAMM HMMA 867 Guide Specifications for Laminated Core Hollow Metal Doors and Frames; 2016.

- Q. NFPA 80 Standard for Fire Doors and Other Opening Protectives; 2022.
- R. NFPA 252 Standard Methods of Fire Tests of Door Assemblies; 2022.
- S. SDI 117 Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
- T. UL (DIR) Online Certifications Directory; Current Edition.
- U. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- V. UL 1784 Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 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 any indicated finish requirements.
- D. Design Submittals: Manufacturer to submit anchor design analysis calculations for blastresistant doors signed and sealed by specialty design engineer experienced in this type of work and licensed in the State in which the Project is located.
- E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 - 2. Republic Doors, an Allegion brand; ____: www.republicdoor.com/#sle.
 - 3. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

- 1. Steel Sheet: Comply with one or more of the following requirements; galvannealed 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. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
- 4. Door Edge Profile: Manufacturers standard for application indicated.
- 5. Typical Door Face Sheets: Flush.
- 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
- 7. 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.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. 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.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Type ____, Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 Standard-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: 20 gauge, 0.032 inch (0.8 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- C. , Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 Standard-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: 20 gauge, 0.032 inch (0.8 mm), minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- D. ____, Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 Standard-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: 20 gauge, 0.032 inch (0.8 mm), minimum.
 - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - 3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.

4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Knock-down type.1. Weatherstripping: Integral, recessed into frame edge.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch (150 mm), maximum, above floor at 45 degree angle.
 - 3. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
 - 4. Frame Finish: Factory primed and field finished.
- E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- F. Mullions for Pairs of Doors: Fixed, with profile similar to jambs.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Transom Bars: Fixed, of profile same as jamb and head.
- I. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (102 mm) high to fill opening without cutting masonry units.
- K. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 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 (0.4 mm) dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 - 1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.06 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
 - 1. Size: As indicated on drawings.
 - 2. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel.
 - 3. Glazing: 1/4 inch (6.4 mm) thick, tempered glass, in compliance with requirements of authorities having jurisdiction.
- B. Glazing: As specified in Section 088000, factory installed.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- D. Astragals and Edges for Double Doors: Pairs of door astragals, and door edge sealing and protection devices.
 - 1. UL listed products in compliance with requirements of authorities having jurisdiction.
 - 2. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.

- 3. Astragal Type: Split, two parts, and with automatic locking, cutouts for other door hardware, and sealing gasket.
- 4. Edge Type: Beveled edge
- 5. Material: Aluminum.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 087100.
- E. Coordinate installation of electrical connections to electrical hardware items.
- F. Touch up damaged factory finishes.

3.04 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 (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

SECTION 081416 FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, acoustical, special function, and _____.

1.02 RELATED REQUIREMENTS

- A. Section 081113 Hollow Metal Doors and Frames.
- B. Section 087100 Door Hardware.
- C. Section 088000 Glazing.
- D. Section 092116 Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.
- E. Section 099123 Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI/SDI A250.8 Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- C. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- E. ASTM E2112 Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.
- F. NEMA LD 3 High-Pressure Decorative Laminates; 2005.
- G. NFPA 252 Standard Methods of Fire Tests of Door Assemblies; 2022.
- H. UL 10B Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- I. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- J. WDMA I.S. 1A Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

PART 2 PRODUCTS

2.01 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.

2.02 DOOR AND PANEL CORES

2.03 DOOR FACINGS

2.04 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- D. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

SECTION 083100 ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

- A. Section 087100 Door Hardware: Mortise cylinder and core hardware.
- B. Section 099123 Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. 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.
- C. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM B211/B211M Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.
- E. Manufacturer's qualification statement.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Aluminum.
 - 3. Size: 30" x30"
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 - 6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- B. Ceiling-Mounted Units ____
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Aluminum.
 - 3. Size Lay-In Grid Ceilings: To match module of ceiling grid.
 - 4. Size Other Ceilings: 30" x30"
 - 5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. Babcock-Davis; _____: www.babcockdavis.com/#sle.
 - 2. Best Access Doors: www.bestaccessdoors.com/#sle.

- 3. Nystrom, Inc; HVAC Access Doors: www.nystrom.com/#sle.
- 4. Substitutions: See Section 016000 Product Requirements.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Door Style: Single thickness with rolled or turned in edges.
 - 2. Single Steel Sheet Door Panels: 16-gauge, 0,0625-inch (1.6 mm) minimum thickness.
 - 3. Aluminum Finish: Natural brushed.
 - 4. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
 - 5. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

SECTION 083313 COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Rough openings.
- B. Section 079200 Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 092116 Gypsum Board Assemblies: Rough openings.
- D. Section 099123 Interior Painting: Field paint finish.

1.03 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. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.04 SUBMITTALS

- A. See Section 013000 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. Manufacturer's Installation Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.
- E. Manufacturer's qualification statement.
- F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Coiling Counter Doors:
 - 1. Alpine Overhead Doors, Inc; Counter Shutter Rolling Shutters: www.alpinedoors.com/#sle.
 - 2. Overhead Door Corporation; Counter Door Model 650: www.overheaddoor.com/#sle.
 - 3. Raynor Garage Doors; DuraShutter, Model ____: www.raynor.com/#sle.
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 COILING COUNTER DOORS

- A. Coiling Counter Metal Doors, Non-Fire-Rated: Aluminum slat curtain.
 - 1. Mounting: Between jambs, within prepared opening.
 - 2. Nominal Slat Size: 1-1/4 inches (32 mm) wide.
 - 3. Slat Profile: Flat, perforated.
 - 4. Finish, Aluminum: Anodized.
 - 5. Color: From manufacturer standard range of 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.

2.03 COMPONENTS

- A. Metal 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. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch (1.3 mm).
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
 - 1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.
- 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.
- 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 (10 kg) nominal force to operate.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

- B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).
- C. Maximum Variation From Level: 1/16 inch (1.5 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

SECTION 088000 GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 062000 Finish Carpentry: _____ components with requirement for plastic.
- B. Section 072500 Weather Barriers.
- C. Section 072700 Air Barriers.
- D. Section 079200 Joint Sealants: Sealants for other than glazing purposes.
- E. Section 081113 Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- F. Section 081416 Flush Wood Doors: Glazed lites in doors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C920 Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1036 Standard Specification for Flat Glass; 2021.
- F. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- G. ASTM C1172 Standard Specification for Laminated Architectural Flat Glass; 2019.
- H. ASTM C1193 Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
- I. ASTM C1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- J. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- K. ASTM E1300 Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- L. ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- M. ASTM F476 Standard Test Methods for Security of Swinging Door Assemblies; 2023.
- N. GANA (SM) GANA Sealant Manual; 2008.
- O. GANA (LGRM) Laminated Glazing Reference Manual; 2019.
- P. NFRC 100 Procedure for Determining Fenestration Product U-factors; 2023.
- Q. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- R. NFRC 300 Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's qualification statement.
- E. Installer's gualification statement.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- Installer Qualifications: Company specializing in performing work of the type specified and with B. at least three years documented experience.
 - Provide company, field supervisors, and installers that hold active ANSI accredited 1. certifications in appropriate categories for work specified.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- Maintain minimum ambient temperature before, during and 24 hours after installation of glazing В. compounds.

1.07 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for C. delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Fabricators:
 - 1. GGI General Glass International: www.generalglass.com/#sle.
 - Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle. 2.
 - 3. Viracon. Inc: www.viracon.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Float Glass Manufacturers:
 - Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle. 1.
 - Guardian Glass, LLC; ____: www.guardianglass.com/#sle. 2.
 - Pilkington North America Inc; _____: www.pilkington.com/na/#sle. 3.
 - Substitutions: See Section 016000 Product Requirements. 4.
- C. Laminated Glass Manufacturers:
 - 1.
 - Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle. Viracon, Architectural Glass segment of Apogee Enterprises, Inc; _____: 2. www.viracon.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES
- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I Transparent Flat, Class 1 Clear, Quality Q3.
 - 2. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 - 3. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Complies with ANSI Z97.1 Class B or 16 CFR 1201 Category I impact test requirements.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Glass: Any of the manufacturers specified for float glass.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Spacer Color: Black.
 - 4. Edge Seal:
 - a. Color: Black.
 - 5. Purge interpane space with dry air, hermetically sealed.
- C. Type IG-1 Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Space between lites filled with argon.
 - 3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum. a. Tint: Clear.
 - Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
 a. Tint: Clear.

- 5. Total Thickness: 1 inch (25.4 mm).
- 6. Thermal Transmittance (U-Value), Summer Center of Glass: _____, nominal.
- 7. Shading Coefficient: _____, maximum.
- 8. Glazing Method: Dry glazing method, gasket glazing.

2.05 BASIS OF DESIGN - INSULATING GLASS UNITS

- A. Basis of Design Insulating Glass Units: Vision glazing, with low-e coating.
 - 1. Applications: Exterior insulating glass glazing unless otherwise indicated.
 - 2. Space between lites filled with argon.
 - 3. Total Thickness: 1 inch (25.4 mm).
 - 4. Thermal Transmittance (U-Value), Summer Center of Glass: _____, nominal.
 - 5. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 6. Spacer Color: Black.
 - 7. Edge Seal:
 - 8. Color: Black.
 - 9. Purge interpane space with dry air, hermetically sealed.

2.06 GLAZING UNITS

- A. Type G-1 Monolithic Exterior Vision Glazing:
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Glass Type: Fully tempered float glass.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch (6.4 mm), nominal.
 - 5. Shading Coefficient: ____, maximum.
 - 6. Solar Heat Gain Coefficient (SHGC): _____, maximum.
 - 7. Glazing Method: Dry glazing method, gasket glazing.

2.07 GLAZING COMPOUNDS

- A. Type GC-1 Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.
- B. Type GC-2 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.
- C. Manufacturers:
 - 1. Bostik Inc; ____: www.bostik-us.com/#sle.
 - 2. Dow Corning Corporation; ____: www.dowcorning.com/construction/#sle.Dow Corning Corporation; ____: www.dowcorning.com/construction/#sle.
 - 3. Tremco Commercial Sealants & Waterproofing; Proglaze: www.tremcosealants.com/#sle.
 - 4. Substitutions: See Section 016000 Product Requirements.

2.08 ACCESSORIES

- A. Concealed nonprogressive structural glass mounting system.
- B. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- D. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured

Shore A durometer hardness; coiled on release paper; black color.

- 1. Width: As required for application.
- E. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 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.

3.06 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.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.07 SCHEDULES

- A. Steel Door Glazing:
 - 1. Exterior: Glass _____, 1/4 inch (6 mm) thick, install glass using wet method with Type GC- ___ glazing compound.
- B. Flush Wood Door Glazing:

- 1. Interior: Glass _____, 1/4 inch (6 mm) thick, install glass using wet method with Type GC-____glazing compound.
- 2. Exterior: Glass _____, 1/4 inch (6 mm) thick, install glass using dry method with Type GC- ____ glazing compound.

END OF SECTION

SECTION 089100 LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 072500 Weather Barriers: Sealing frames to water-resistive barrier installed on adjacent construction.
- B. Section 076200 Sheet Metal Flashing and Trim.
- C. Section 233100 HVAC Ducts and Casings: Ductwork attachment to louvers.

1.03 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 511 Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).
- D. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- E. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.04 SUBMITTALS

- A. See Section 013000 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. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include lubrication schedules, adjustment requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
 - 1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:

- 1. Airline Louvers; _____: www.airlinelouvers.com/#sle.
- 2. Airolite Company, LLC; ____: www.airolite.com/#sle.
- 3. Ruskin Company; Louvers: www.ruskin.com/#sle.
- 4. Substitutions: See Section 016000 Product Requirements.

2.02 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 (of 1.2 kPa) without damage or permanent deformation.
 - 2. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 3. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.
 - 4. Hinged Units: Provide secondary frame to which louver frame is attached; non-ferrous hinges.
- B. _____ Louvers, ____: Aluminum outer frames, louver perimeter frame, thermally broken, air ventilator with overlapping louvers.
 - 1. Blades: Drainable.
 - 2. Frame: ____ inch (____ mm) deep, ____ inch (____ mm) wide, extruded aluminum.
 - 3. Frame Size: As indicated on drawings.
- C. Stationary Louvers, ____: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
 - 1. Blades: Drainable.
 - 2. Frame: 4 inches deep (100 mm deep), channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
 - 3. Aluminum Thickness: Frame 12 gauge, 0.0808 inch (2.05 mm) minimum; blades 12 gauge, 0.0808 inch (2.05 mm) minimum.
 - 4. Aluminum Finish: Class I natural anodized; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.
- B. Color: As indicated on drawings.

2.05 ACCESSORIES

- A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- C. Fasteners and Anchors: Galvanized steel.
- D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

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.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

SECTION 092116 GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Cementitious backing board.
- G. Gypsum wallboard.
- H. Joint treatment and accessories.
- I. Bullet resistant sheathing and wallboard.

1.02 RELATED REQUIREMENTS

- A. Section 054000 Cold-Formed Metal Framing: Structural steel stud framing.
- B. Section 061000 Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 072100 Thermal Insulation: Acoustic insulation.
- D. Section 072500 Weather Barriers: Water-resistive barrier over sheathing.
- E. Section 079200 Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. AISI S220 North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- B. AISI S240 North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- C. ANSI A108.11 American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
- D. ANSI A118.9 American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.
- E. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2019.
- 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 A1003/A1003M Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- H. ASTM C1007 Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.
- I. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- J. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- K. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- L. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board; 2023.

- M. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- N. 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.
- O. ASTM C1047 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- P. ASTM C1178/C1178M Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.
- Q. ASTM C1325 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).
- R. ASTM C1396/C1396M Standard Specification for Gypsum Board; 2017.
- S. ASTM C1658/C1658M Standard Specification for Glass Mat Gypsum Panels; 2019, with Editorial Revision (2020).
- T. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- U. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- V. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- W. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.
- X. ASTM E413 Classification for Rating Sound Insulation; 2022.
- Y. ASTM E1414/E1414M Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2021a.
- Z. GA-216 Application and Finishing of Gypsum Panel Products; 2021.
- AA. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- D. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
- E. SSFSA Manufacturer Qualification: Submit documentation of manufacturer association membership.
- F. SSMA Manufacturer Qualification: Submit documentation of manufacturer association membership.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.
- B. Manufacturer Qualifications: Member of Supreme Steel Framing System Association (SSFSA): www.ssfsa.com/#sle.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
 - 1. Structural Grade: As required to meet design criteria.
- B. Manufacturers Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich; ____: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE; ____: www.marinoware.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
 - 1. Studs: C-shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C-shaped.
 - 4. Flexible Track: Flexible framing consisting of adjustable leg straps and pivoting, hinged track brackets designed to provide curved framing assemblies of varying radii.
 - a. Dimensions: 3-5/8 inches (92 mm) deep by 1-3/16 inches (30.2 mm) high in lengths and configurations indicated.
 - b. Products:
 - 1) ClarkDietrich; 360TRAK: www.clarkdietrich.com/#sle.
 - 2) Substitutions: See Section 016000 Product Requirements.
- D. Non-structural Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 - 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
 - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 - 3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
 - 4. Drywall Corner Clips: Drywall clips help support drywall to reduce wood blocking on top plates, end walls, and corners.
 - 5. Steel Column and Beam Drywall Clip: UL-listed slip-on clips to connect gypsum board to steel beams and columns for fireproofing.

2.03 BOARD MATERIALS

- A. Manufacturers Gypsum-Based Board:
 - 1. American Gypsum Company; ____: www.americangypsum.com/#sle.

- 2.
- CertainTeed Corporation; ____: www.certainteed.com/#sle. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle. 3.
- Substitutions: See Section 016000 Product Requirements. 4.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - Application: Use for vertical surfaces and ceilings, unless otherwise indicated. 1.
 - Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint 2 finish, of the same core type and thickness may be substituted for paper-faced board.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - Mold-resistant board is required whenever board is being installed before the building а is enclosed and conditioned.
 - At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated 4. tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 5. Thickness:
 - a. Vertical Surfaces: 1/2 inch (13 mm).
 - b. Ceilings: 1/2 inch (13 mm).
- C. Backing Board For Wet Areas:
 - Application: Surfaces behind tile in wet areas including. 1.
 - 2. Application: Horizontal surfaces behind tile in wet areas including countertops.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - ANSI Cement-Based Board: Non-avpsum-based; aggregated Portland cement panels 4. with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch (13 mm).
 - Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as 5. defined in ASTM C1178/C1178M.
 - a. Regular Type: Thickness 1/2 inch (13 mm).
- D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - Application: Ceilings, unless otherwise indicated, 1.
 - Thickness: 1/2 inch (13 mm). 2.
 - Edges: Tapered. 3.

2.04 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches (50.8 mm).
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: See Section 072500.
- Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel D. sheet ASTM A924/A924M G90, unless noted otherwise.
 - Types: As detailed or required for finished appearance. 1.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, 1. except as otherwise indicated.
 - Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as 2. otherwise indicated.
 - 3. Joint Compound: Drying type, vinyl-based, ready-mixed.
 - Joint Compound: Setting type, field-mixed. 4.

- F. Finishing Compound: Surface coat and primer, takes the place of skim coating.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
- C. Studs: Space studs at 16 inches on center (at 406 mm on center).
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. 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.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 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. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with waterresistant sealant.
- C. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.

3.06 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. 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 (0.8 mm).
- D. Spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 093000 TILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Ceramic trim.
- D. Non-ceramic trim.

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 07 9005 Joint Sealers.
- C. Section 09 2116 Gypsum Board Assemblies: Description and installation of tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.
- B. 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).
 - 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.
 - 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.
 - 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).

- 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.
- 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.
- C. ANSI A137.1 American National Standard Specifications for Ceramic Tile; 2022.
- D. ASTM C373 Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- E. TCNA (HB) Handbook for Ceramic, Glass, and Stone Tile Installation; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting minimum of one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 013000 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 (457 by 457 mm) 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 016000 Product Requirements, for additional provisions.
 - 2. Extra Tile: 2 percent of each size, color, and surface finish combinationbut not less than 10 square feet of each type.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of ANSI A108/A118/A136 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

1.07 MOCK-UPS

A. Include Tiling in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 - PRODUCTS

2.01 TILE

- A. Manufacturers: All products of each type by the same manufacturer.
 - 1. See Drawings for manufacturers.
 - 2. Substitutions: See Section 016000 Product Requirements.
- B. Ceramic Mosaic Tile, Type : ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Color(s): As indicated on drawings.
- C. Quarry Tile, Type __: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: Over 3.0 but not more than 5.0 percent as tested in accordance with ASTM C373.
 - 2. Surface Finish: Unglazed.
 - 3. Color(s): As indicated on drawings.
 - 4. Trim Units: Matching bullnose, cove, cove base, and window sill or step nosing shapes in sizes coordinated with field tile.
 - 5. Products: Refer to Finish Legend
- D. Porcelain Floor Tile
 - 1. See Drawings for products.
 - 2. Colors, Sizes, and Patterns: See Finish Plan and Finish Legend.
- E. Porcelain Wall Tile
 - 1. See Drawings for products.
 - 2. Colors, Sizes, and Patterns: See Interior Elevations and Finish Legend.
- F. 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.

2.02 TRIM AND ACCESSORIES

1.

- A. Porcelain/Ceramic Trim: Matching bullnose shapes in sizes coordinated with field tile.
 - 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.

- b. Genesis APS International: www.genesis-aps.com/#sle.
- c. Substitutions: See Section 016000 Product Requirements.

2.03 ADHESIVE/BOND COAT MATERIALS

- A. Manufacturers:
 - 1. Bostik Inc: www.bostik-us.com.
 - 2. Mapei Corporation: www.mapei.com.
 - 3. Substitutions: See Section 01 6000 Product Requirements.
- B. Adhesive: Latex-Portland Cement Mortar Bond Coat, ANSI A118.4.

2.04 GROUTS

- A. Manufacturers:
 - 1. Bostik Inc: www.bostik-us.com.
 - 2. LATICRETE International, Inc; ____: www.laticrete.com/#sle.
 - 3. Hydroment.
 - 4. Mapei Corporation: www.mapei.com.
 - 5. Substitutions: See Section 016000 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.

2.05 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, selfadhering 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.

2.06 ACCESSORY MATERIALS

- A. Cleavage Membrane: No. 15 (6.9 kg) 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, selfadhering 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 (50 x 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.

F. Mesh Tape: 2-inch (50 mm) wide self-adhesive fiberglass mesh tape, complies with ASTM C475.

PART 3 - EXECUTION

3.01 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.
- 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. Sound tile after setting. Replace hollow sounding units.
- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- L. Grout tile joints. Use standard grout unless otherwise indicated.Use epoxy grout unless otherwise indicated.
- M. 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.
- N. 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.

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 (15.9 mm), unless otherwise indicated.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.08 SCHEDULE

A. See Finish Schedule on Drawings.

END OF SECTION

SECTION 095100 ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 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.

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 072100 Thermal Insulation: Acoustical insulation.
- C. Section 07 9005 Joint Sealers: Acoustical sealant.

1.03 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.

1.04 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.

1.05 SUBMITTALS

- A. See Section 013000 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 (<u>x</u> mm) in size illustrating material, edge detail and finish of acoustical units.
- E. Samples: Submit two samples each, 8 inches (____ mm) 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.

1.06 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.

1.07 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.

1.08 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), 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.

1.09 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.
 - 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.

1.10 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 016000 Product Requirements, for additional provisions.
- C. Deliver extra stock to Owner's representative.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc; [Basis of Design]: www.armstrong.com.
 - 2. USG Corporation: www.usg.com/ceilings/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc; [Basis of Design]: www.armstrong.com.
 - 2. USG Corporation: www.usg.com/ceilings/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.

2.02 ACOUSTICAL UNITS

- A. Acoustical Panels:
 - 1. As indicated on Ceiling Finish Legend.

2.03 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. 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.

- C. 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.
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- E. 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.
- F. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
 1. Products: 15/16-inch Exposed Tee Grid, equal to Suprafine by Armstrong.

2.04 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 (2 mm) 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

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- 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 expressy permitted by manufacturer's printed recommendations.

3.02 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.

3.03 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 (152 mm) 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 (25 mm) 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.

3.04 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.
- 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 (6 m) 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.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 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

SECTION 096466 WOOD ATHLETIC-FLOORING ASSEMBLIES

PART 1 - GENERAL

1.01 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.

1.02 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. Concrete Slab Depression: 1-3/4" using 7/16" Maple for Ultra Star System.
 - c. Surface Finish: steel troweled and finished smooth.
 - d. Concrete Tolerance: 1/8" in radius of 10'.
 - e. 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.

1.03 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.

1.04 SUBMITTALS

- A. Manufacturer's Qualification Data
 - 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.

1.05 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.

1.06 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-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete gymnasium floor.

1.07 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

2.01 MANUFACTURERS/PRODUCT

A. Robbins Sport Surfaces, Cincinnati, OH, 800-543-1913, [Basis of Design]: www.robbinsfloor.com.

2.02 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.
 - b. Horner Flooring; "Zenith LP": 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
 - 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.
- 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.)

2.03 ACCESSORIES

A. Accessory items recommended by manufacturer for complete system.

PART 3 - EXECUTION

3.01 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.

3.02 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.

3.03 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) Cross court volleyball.
- (e) Logo/Graphics.
- (f) Pickleball
- 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

SECTION 096500 RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.
- D. Waterjet cutting of resilient flooring.

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 033000 Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.
- C. Section 090561 Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 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 F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F1861 Standard Specification for Resilient Wall Base; 2021.
- D. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2169 Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).
- F. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- G. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene minimum of one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 013000 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 (<u>by</u> mm) 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 016000 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.
- I. Waterjet cutting company will supply approval drawings indicating:
 - 1. Design
 - 2. Color Specifications
 - 3. Tolerance
 - 4. Revisions to line integrity
 - 5. Area for approval signature and date
 - 6. Installation map to include telephone number of waterjet company
 - 7. Installation map to include these sentences:
 - a. Removal of low tack tape is to take place prior to the drying of the adhesive.
 - b. Success of this project is predicated on a smooth, flat floor.

1.06 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.

1.07 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.
 - 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.

1.08 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 (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

1.09 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

2.01 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) minimum.
 - 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.
 - Manufacturer/ Style/ Color: See Finish Legend.
 a. Substitutions: Reference Section 01 6000

2.02 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: See Finish Legend
 - a. Substitutions: See Section 016000 Product Requirements.
 - 2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Nominal Thickness: 0.1875 inch (4.75 mm).
 - 5. Nosing: Square.
 - 6. Striping: 2 inch (24 mm) wide contrasting color abrasive strips.
 - 7. Color: As indicated on drawings.

2.03 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 (3.2 mm).
 - 3. Finish: As selected by Architect.
 - 4. Length: Roll.
 - 5. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com.
 - b. Roppe Corporation; Basis of Design: www.roppe.com
 - c. Substitutions: See Section01 6000-Product Requirements.

PART 3 - EXECUTION

3.01 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. Test in accordance with Section 090561.
 - 2. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
 - 4. Follow moisture and alkalinity remediation procedures in Section 090561.
- 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.

3.02 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.

3.03 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.

3.04 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.
- 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 (____ mm) 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

SECTION 096566 RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fluid-applied, homogeneous polyurethane flooring.
- B. Fluid-applied polyurethane flooring over rubberized base mat.
- C. Painted game lines.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.
- B. Section 090561 Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- C. Section 096500 Resilient Flooring.

1.03 REFERENCE STANDARDS

- A. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D2240 Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).
- C. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- F. ASTM F2772 Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2011 (Reapproved 2019).
- G. DIN EN 14904 Surfaces for Sports Areas Indoor Surfaces for Multi-Sports Use Specification; 2006.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.
- D. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.
- E. Test Reports: Submit test reports showing compliance with DIN EN 14904.
- F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- G. Manufacturer's Instructions: Indicate standard and special installation procedures.
- H. Installer's qualification statement.
- Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 See Section 016000 Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F (21 to 35 degrees C) for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F (10 degrees C) or to go above 100 degrees F (38 degrees C).

PART 2 PRODUCTS

2.01 FLUID-APPLIED ATHLETIC FLOORING

- A. Manufacturers: All products by the same manufacturer.
 - 1. Action Floor Systems; Herculan MF: www.actionfloors.com/#sle.
 - 2. Connor Sports Flooring; ____: www.connorfloor.com/#sle.
 - 3. Dynamic Sports Construction Inc; _____: www.dynamicsportsconstruction.com/#sle.
 - 4. Robbins Sports Surface : www.robbinsfloor.com/#sle. (BASIS OF DESIGN) Pulastics Classic 110
 - 5. Substitutions: See Section 016000 Product Requirements.
- B. Homogeneous Polyurethane Flooring System, Type _____
 - 1. Total System Thickness: Minimum 3/8 inch (9.5 mm).
 - 2. Primer: Manufacturer's recommended standard for project substrate.
 - 3. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, with properties as follows:
 - a. Formulation: Mercury catalyzed.
 - b. Tensile Strength: Minimum 400 psi (2.75 MPa), per ASTM D412.
 - c. Hardness: 50 to 60, when tested in accordance with ASTM D2240 using Type A durometer.
 - d. Temperature Stability: Unaffected over range of 0 to 120 degrees F (minus 18 to 49 degrees C).
 - e. Ultimate Elongation: Minimum 250 percent, per ASTM D412.
 - 4. Finish Coating: Manufacturer's standard pigmented, two-component polyurethane wear layer.
 - a. Color: As selected from manufacturer's standard range.
 - b. Finish: Smooth gymnasium.
- C. Polyurethane Flooring Over Rubberized Base Mat: Robbins Pulastics Classics 110
 - 1. Total System Thickness: Minimum 1/4 inch (6.4 mm); with minimum 0.07 inch (1.8 mm) polyurethane.
 - 2. Base Mat: Prefabricated rubber mat of recycled rubber granules in polyurethane binder.
 - 3. Sealer: Manufacturer's standard two-component polyurethane compound designed to seal base mat before application of resin topcoat.
 - 4. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, zero mercury formulation, with properties as follows:
 - a. Tensile strength: Minimum 1000 psi (6.9 MPa), per ASTM D412.
 - b. Durometer Hardness, Type A: Minimum of 70, when tested in accordance with ASTM D2240.

- c. Ultimate Elongation: Minimum 100 percent, per ASTM D412.
- 5. Finish: Manufacturer's standard pigmented two-component polyurethane topcoat, matte finish, in color as selected from manufacturer's standard range.

2.02 ACCESSORIES

- A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.
- B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. 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 athletic flooring to substrate.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 090561.
 - 2. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius (1/1000).
- C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.
- D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Fluid-Applied, Homogeneous Polyurethane Flooring:
 - 1. Mix components in strict accordance with manufacturer's written instructions. Apply at manufacturer's recommended rates using airless spray equipment. Allow sufficient time to dry completely between coatings.
 - 2. Apply primer over prepared substrate.
 - 3. Apply base layer and one or more top layers in strict compliance with manufacturer's recommendations to achieve minimum thickness specified.
 - 4. Apply finish coating to achieve an even, consistent appearance.
 - 5. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
- D. Fluid-Applied Polyurethane Flooring Over Base Mat:
 - 1. Mix components in strict accordance with manufacturer's written instructions, and apply at manufacturer's recommended rates. Allow sufficient curing time between coatings.

- 2. Unroll base mat and allow to relax before beginning installation.
- 3. Apply adhesive to substrate with notched trowel, and roll base mat into fresh adhesive. Do not allow compression fit at any seams. Roll mat with weighted linoleum roller immediately upon application of base mat and again after 45 minutes to insure that base mat is firmly adhered to substrate.
- 4. Thoroughly mix and apply seal coat to surface of base mat with steel trowel.
- 5. Apply resin wear layer in number of lifts recommended by manufacturer, applying wetinto-wet to achieve a seamless surface. Sand any imperfections in surface after wear layer has cured.
- 6. Thoroughly mix and apply finish coat with airless sprayer to achieve uniform appearance.
- 7. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

SECTION 096723.02 DECORATIVE FLAKE RESINOUS FLOORING

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. This Section includes one resinous flooring system, one with epoxy body.
 - 1. Application Method: Squeegee, screed, and broadcast.

1.03 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.

1.04 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.
- 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.

1.05 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.

1.06 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

1.07 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

2.01 RESINOUS FLOORING

- A. Available Products: Subject to compliance with requirements.
 - 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.

NOTE: COMPONENTS LISTED ABOVE ARE THE BASIS OF DESIGN INTENT; ALL BIDS WILL BE COMPARED TO THIS STANDARD INCLUDING RESIN CHEMISTRY, COLOR, WEARING SURFACE, THICKNESS, AND INSTALLATION PROCEDURES, INCLUDING NUMBER OF COATS. CONTRACTOR SHALL BE REQUIRED TO COMPLY WITH ALL THE REQUIREMENTS OF THE SPECIFICATIONS AND ALL OF THE COMPONENTS REQUIRED BY THE SPECIFICATIONS, WHETHER OR NOT SUCH PRODUCTS ARE SPECIFICALLY LISTED ABOVE.

- 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 x 10⁶ psi per ASTM D-790
 - 5. Hardness: .85 to .90 per ASTM D-2240, Shore D
 - 6. Linear Coefficient of Thermal Expansion: 17 x 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

2.02 ACCESSORY MATERIALS

- A. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated. No Single component or cementitious materials.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 EXECUTION

3.01 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.

3.02 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.
 - 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.
 - 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.

SECTION 096813 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 013000 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 (____ mm) 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 016000 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 016000 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.

2.03 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

3.01 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. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. 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.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 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.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

SECTION 098430 SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing panels.

1.02 RELATED REQUIREMENTS

A. Section 099123 - 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 C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- D. ASTM E795 Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2023.

1.04 SUBMITTALS

- A. See Section 013000 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. Acoustics First Corporation; ____: www.acousticsfirst.com/#sle.
 - 2. RPG Acoustical Systems, Inc; Modex Series: www.rpgacoustic.com/#sle.
 - 3. Rockfon; Baffles: www.rockfon.com/#sle.
 - 4. TECHLITE; Accent Fabric Wrapped Panels: www.techlite.com/#sle.
 - 5. Substitutions: See Section 016000 Product Requirements.
- 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 and Ceilings:
 - 1. Panel Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
 - 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: 24 inches by 48 inches (610 mm by 1220 mm).
 - 4. Panel Thickness: 2 inches (25.4 mm).
 - 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.

2.02 METAL SOUND-ABSORBING UNITS

- A. Manufacturers:
 - 1. IAC Acoustics; Noise-Foil Acoustical Metal Panels: www.iacacoustics.com/#sle.
 - 2. Noise Barriers; QuietPerf Absorption Panels: www.noisebarriers.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.
- B. Metal Acoustical Panels for Walls: Wool- or fiberglass-filled core in accordance with ASTM C665; mildew resistant and enveloped by metal casing.
 - 1. 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.
 - 2. Panel Thickness: 2 inches (50.8 mm).
 - 3. Perforated Panel: Pattern
 - a. Panel Width: 30 inches (762 mm), nominal.
 - b. Hole Diameter: 3/32 inch (2.38 mm), nominal.
 - c. Finish: Powder coat.
 - d. Color: As selected from manufacturer's full range of colors.
 - e. Color of acoustic back up material shall be black.
 - 4. Mounting: Use fixing clips to attach to metal hat channels anchored to wall substrates. a. Edge Profile: Reveal.

2.03 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 (1.6 mm) for thickness, overall length and width, and squareness from corner to corner.
- C. Factory-applied finishes on wood veneer panels to be uniform, smooth, and without blemishes.

2.04 ACCESSORIES

- A. Spline-Mounting Accessories: Manufacturer's standard concealed connecting splines of extruded aluminum designed for screw attachment to walls, with coordinating moldings and trim for interior and exterior corners and miscellaneous conditions.
 - 1. Color of Exposed Trim: As selected from manufacturer's standards.
- B. Fixing Clips: Manufacturers standard for application as indicated.
- C. Furring Strips: Metal hat channel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.
- D. Furring Mounted Wood Veneer Panels:
 - 1. Install furring strip along meeting edges of adjacent panels to ensure they are attached to same furring strip along abutted edge; 24 inch (610 mm) on center, maximum.
 - 2. Install acoustic back-up material between furring as required for application.
 - 3. Adhere first panel from edge to furring strip, and attach subsequent panels using fixing clips.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 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.

SECTION 099100 PAINTING

PART 1 - GENERAL

1.01 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.

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 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.

1.03 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.

1.04 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.05 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.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- 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.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.08 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.

1.09 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.

1.10 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

2.01 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.
 - 2. Benjamin Moore & Co: www.benjaminmoore.com.
 - 3. PPG Architectural Finishes, Inc: www.ppgaf.com.
- C. Block Fillers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 Product Requirements.

2.02 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.

2.03 PAINT SYSTEMS - EXTERIOR

- A. 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).
- B. 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).
- C. 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).

- D. 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).

2.04 PAINT SYSTEMS - INTERIOR

- A. 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).
- B. 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).
- C. 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.
- D. 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).
- E. 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).
 - 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).
- F. Gypsum Board, Epoxy 3 Coat System, (Pre-Catalyzed Water-Based), (for Toilets, kitchen, concessions and wet areas):
 - 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).
- G. 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).
 - Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel Enamel, B20-2600 (0 g/l voc).

2.05 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

3.01 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.

3.02 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. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. 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.
- J. 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.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 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. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 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.

3.05 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.

3.06 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

3.07 SCHEDULE - SURFACES TO BE FINISHED

A. Paint the surfaces described in PART 2, Paint Systems Articles.

3.08 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.
- 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.
- 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.

SECTION 101400 SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cash allowance for signs.
- B. Room and door signs.
- C. Emergency evacuation maps.
- D. Occupancy limit signs.
- E. Building identification signs.
- F. Plaque.

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. Detail of Project Plaque in General Conditions section of Project Manual.
- C. Section 01 5813 Temporary Project Signage.
- D. Section 04 2000 Unit Masonry Assemblies.
- E. Section 09 2116 Gypsum Board Assemblies.
- F. Division 22 & 23 Mechanical Identification.
- G. Division 26 Electrical Identification.

1.03 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.

1.04 SUBMITTALS

- A. See Section 013000 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. Shop Drawings: Submit shop drawings of each type of sign.
- E. 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.
- F. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- G. Verification Samples: Submit 1 sample of each type of sign, in finish as selected.

- H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- I. Manufacturer's Qualification Statement.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 Product Requirements, for additional provisions.
 - 2. Curved Sign Media Suction Cups: Two; for removing media.
 - 3. Curved Sign Media Suction Cups: Provide 12 suction cups for Owner's use, for removal of clear lens on curved frame signage to change graphic background.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 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.

1.07 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.

1.08 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image (for panel signage).
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs (Exterior Doors, Life Safety, and Roof ID Sign):
 - 1. APCO Signs: www.apcosigns.com.
 - 2. Best Sign Systems, Inc: www.bestsigns.com.
 - 3. Mohawk Sign Systems, Inc: www.mohawksign.com.
 - 4. Seton Identification Products: www.seton.com/aec.
 - 5. TakeForm, Inc.: www.takeform.net.
 - 6. Substitutions: See Section 016000 Product Requirements.
- B. Curved Signs (Interior Doors):
 - 1. APCO Signs: www.apcosigns.com.
 - 2. Vista System; V200 Series: www.vistasystem.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.
- C. Dimensional Letter Signs:
 - 1. Andco Industries Corp.
 - 2. Gemini, Inc.
 - 3. Leeds Architectural Letters, Inc.
 - 4. Substitutions: See Section 016000 Product Requirements.
- D. Plaques:
 - 1. Leeds Architectural Letters, Inc.

- 2. Gemini Inc.
- 3. Substitutions: See Section 016000 Product Requirements.

2.02 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. Interior and Exterior Door Signs: Provide a sign at every door indicated on Architect's drawings.
- C. Interior Flat Signs:
 - 1. Sign Type: Flat sign with engraved letters.
 - 2. Character Height: 1 inch, and as indicated, or selected.
 - 3. Occupancy Limit Signage: As described below.
 - 4. Sign Height: As indicated on drawings.
 - 5. Sign Width: As indicated on drawings.
 - 6. Classroom and Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings .
 - 7. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings .
 - 8. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings. Sign sizes: As indicated on drawings.
 - 9. Rest Rooms: Identify with pictograms, the names "MEN", "WOMEN", "BOYS", or "GIRLS", as indicated on drawings, and braille. Sign sizes: As indicated on drawings.
 - 10. Roof Identification Sign: As described below.
- D. Interior Door Signs:
 - 1. Product:
 - a. Signs shall be Fusion 57 as manufactured by Takeform, www.takeform.net, or Architect approved equal.
 - b. Substitutions: Section 01 6000 Product Requirements.
 - 2. Engineered and Tested:
 - a. The signage system shall have undergone rigorous testing to ensure longevity and optimal performance. Testing shall include environmental testing to ensure that materials can withstand changes in temperature and humidity without distortion as well as testing to ensure resistance to chemicals and UV effects. Further, mechanical testing shall ensure that the tensile and pull-out strength of mounting hardware is adequate to ensure a safe installation. Test data shall be included with submittals.
 - 3. Typography:
 - a. Type style: see drawings. Copy shall be a true, clean, accurate reproduction of typeface(s) specified. Upper and lower case or all caps shall be as indicated in Sign Type drawings and Signage Schedule. Letter spacing to be normal and interline spacing shall be set by manufacturer.
 - b. Arrows, symbols and logo art: To be provided in style, sizes, colors and spacing as shown in drawings.
 - c. Grade II Braille utilizing perfectly round, clear insertion beads.
 - 4. Evacuation Maps:
 - a. Evacuation maps shall have a unique "you-are-here" orientation as well as two emergency egress paths. The maps shall show location of fire extinguishers, fire pulls, stairwells, elevators and restrooms.
 - 5. Color and Finishes:
 - a. Colors, patterns and artwork: see drawings.
 - b. Message Background: see drawings.

- c. Finishes are to meet current federal ADA and all state and local requirements.
- 6. Signage System:
 - a. The signage shall incorporate a decorative laminate face with applied graphics including all tactile requirements in adherence to ADA specifications.
 - b. All signs, including work station and room ID's, overheads and flag mounts, directionals and directories shall have a matching appearance and constructed utilizing the same manufacturing process to ensure a consistent look throughout.
- 7. Materials:
 - a. Sign face shall be 0.035" (nominal) standard grade, high pressure surface laminate. A painted sign face shall not be acceptable.
 - b. The sign shall incorporate balanced construction with the core sandwiched between laminates to prevent warping. Laminate on the sign face only shall not be acceptable.
 - c. Tactile lettering shall be precision machined, raised 1/32", matte PETG and subsurface colored for scratch resistance.
 - d. Signs shall incorporate a metal accent bar. Bars shall be anodized with a brushed satin finish. Painted bars shall not be acceptable. Refer to drawings.
- 8. Colors:
 - a. Face color shall be custom grade; high pressure laminate, all colors and finishes. Refer to drawings.
 - b. Standard tactile colors shall match manufacturer's ADA standard color selection. Refer to drawings.
 - c. Background: Color shall be custom; resin composite material. Refer to drawings.
- 9. Construction:
 - a. The signage shall, with the exception of directories and directionals, be a uniform $8^{1/2}$ width to facilitate inserts printed on standard width paper.
 - b. Insert components shall have a .080 thickness non-glare acrylic window and shall be inlaid flush to sign face for a smooth, seamless appearance.
 - c. The signage shall include modules allowing for inserts, notice holders, occupancy sliders, marker, magnetic, and cork boards. All modules shall be flush to sign face for a smooth, seamless appearance.
 - d. The laminates (front and back) shall be pressure laminated and precision machined together to a 90-degree angle. Edges shall be smooth, void of chips, burrs, sharp edges and marks.
 - e. The signage shall utilize an acrylic sphere for Grade II Braille inserted directly into a scratch resistant, high pressure laminate sign face. Braille dots are to be pressure fit in high tolerance drilled holes.
 - f. Braille dots shall be half hemispherical domed and protruding a minimum 0.025".
 - g. The signage shall utilize a pressure activated adhesive. The adhesive shall be nonhazardous and shall allow for flexing and deflection of the adhered components due to changes in temperature and moisture without bond failure.
 - h. All signs shall be provided with appropriate mounting hardware. Hardware shall be finished and architectural in appearance and suitable for the mounting surface.
 - i. Some signs may be installed on glass. A blank backer in color selected by Architect is required to be placed on the opposite side of the glass to cover tape and adhesive. The backer shall match the sign in size and shape.
- 10. Printed Inserts:
 - a. The signage shall be capable of accepting paper or acetate inserts to allow changing and updating as required. Insert components shall have a 0.080" thickness non-glare acrylic window and shall be inlayed flush to sign face for a smooth, seamless appearance.
 - b. The signage contractor shall provide and install all signage inserts.

- c. Manufacturer shall provide a template containing layout, font, color, artwork and trim lines to allow Owner to produce inserts on laser or ink jet printer. The template shall be in an Acrobat or Word format (.pdf).
- 11. Schedules and Quantities: See Drawings.
- E. Interior Curved Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Curved signs with engraved removable panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
 - 3. Use ADA Insert Panel, as specified.
 - 4. Character Height: 1 inch (25 mm), and as indicated, or selected.
 - 5. Sign Height: 6 inches (____ mm), unless otherwise indicated.
 - 6. Sign Width: 8 inches, unless otherwise indicated.
 - 7. Classroom and Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings.
 - 8. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
 - 9. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings. Sign sizes: 4" x 8", unless indicated otherwise.
 - 10. Rest Rooms: Identify with pictograms, the names "MEN", "WOMEN", "BOYS", or "GIRLS", as indicated on drawings, and braille. Sign sizes: 7" x 9".
 - 11. Wayfinding: Sizes and quantities as identified on drawings, paper insert will have graphics with school logo at the top and rooms with arrows below locations and text for insert to be determined at a later date.
 - 12. Transparent Insert: Printable on common ink-jet or laser printer. Provide one (1) printed insert per sign based on occupant list to be provided at later date. Provide one (1) extra blank insert per door.
 - 13. Opaque Insert: Provide up to six (6) options for background graphic design based on color and direction to be provided by Architect at later date.
- F. Exterior Wayfinding Signage: Flat panel, exterior grade plastic laminate (in silver or aluminum color), or satin aluminum metal background, with raised black lettering. Sign size: 6" x 8", unless indicated otherwise on drawings.
 - 1. Mount with mechanical fasteners.
- G. Emergency Evacuation Maps:
 - 1. Refer to drawings for locations and quantity.
 - 2. Map content to be provided by Owner/Architect.
 - 3. Mount with stainless steel stand-offs.
 - 4. 1/4" clear acrylic with graphic on second surface.
- H. Exterior Dimensional Letters:
 - 1. Use individual, pin mounted metal letters.
 - a. Finish: Kynar 500.
 - b. Color: As selected by Architect.
 - 2. Mount in location shown on drawings.
- I. Interior Dimensional Letters:
 - 1. Use individual, pin mounted metal letters.
 - a. Finish: Kynar 500.
 - b. Color: As selected by Architect.
 - 2. Mount in location shown on drawings.
- J. Plaque: At inside of entrance as directed by Architect.

- K. Occupancy Limit Signs:
 - 1. Quantity: 3
 - 2. Size: 7 x 5 inches.
 - 3. Mount with stainless steel stand-offs.
 - 4. Material: 1/4-inch clear acrylic with graphic on second surface.

2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame. Engraved Panels: Cast Acrylic engraved through face to expose core as background color:
 - 1. Edges: Square.
 - 2. Corners: Square.
- B. Radius / Curved Signs: One-piece, curved extruded aluminum media holder securing flat, flexible sign media by curved lip on two sides; other two sides closed by end caps; concealed mounting attachment.
 - 1. Size: As specified, unless otherwise indicated.
 - 2. Finish: Natural (clear) anodized.
 - 3. Sign Orientation: Curved in horizontal section.
 - 4. End Caps: Aluminum with finish matching frame and stainless steel screw attachment.
 - 5. ADA Insert Clear, non-glare plastic lens with permanently affixed raised letters and braille.
 - 6. Printed paper insert with graphic and occupant name.
 - 7. Wall Mounting of One-Sided Signs: Mechanical anchorage, with predrilled holes, and set in clear silicone sealant.
- C. Color and Font: Unless otherwise indicated:
 - 1. Character Font: Helvetica, Arial, or other sans serif font.
 - 2. Character Case: Upper case only.
 - 3. Background Color: Clear.
 - 4. Character Color: Contrasting color, to be selected by Architect.

2.04 PLAQUES

- A. Metal Plaques: As detailed in Conditions of Contract.
 - 1. Metal: Aluminum casting.
 - 2. Casting shall be free from pits, scale, sand holes, or other defects.
 - 3. Hand-tool and buff borders and raised copy to produce manufacturer's standard satin polished finish.
 - 4. Background Finish: Provide dark statuary finish (Kynar 500).
 - 5. Background Texture: Manufacturer's standard pebble texture, or as selected.
 - 6. Back of Plaque: Seal with manufacturer's standard clear, transparent, and non-yellowing lacquer, or similar finish with same characteristics and acceptable to Architect; two coats minimum.

2.05 DIMENSIONAL LETTERS

- A. Metal Letters: Height and size as indicated on drawings. Letters shall be cast from 319 aluminum alloy and finished with two (2) coats of baked enamel finish. Color to be selected by Architect.
 - 1. Metal: Aluminum casting.
 - 2. Finish: As selected by Architect from manufacturer's bronze anodized colors.
 - 3. Font: As selected by Architect, with approval of Owner.
 - 4. Mounting: Concealed screws; flush mounting.
 - 5. With 1-inch stainless steel stand-offs where indicated.
- B. Metal Letters: Letters shall be cut from 5052 aluminum alloy. Letters over 1'-0" high to be fabricated.

- 1. Metal: Cut aluminum.
- 2. Thickness: Manufacturer's standard for size of character.
- 3. Finish: Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
- 4. Font: As selected by Architect, with approval of Owner.
- 5. Mounting: Threaded stud with offset spacers. Mounting template designating stud locations is required for all mounting surfaces.
- 6. Ensure substrate material warranties are not impacted by sign installation.
- C. Locations and Sizes of Letters:
 - 1. As indicated on drawings.

2.06 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.
- C. Use clear silicone sealant.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs where indicated:
 - 1. If no location is indicated or space on latch side is limited, obtain Owner's instructions.
- D. Interior Door Signs: Adhere in accordance with Manufacturer's recommendations.
 - 1. General: Installation locations shall be in accordance with ADA specifications. Locate signs where indicated using mounting methods in compliance with manufacturer's written instructions:
 - a. The signage contractor shall coordinate installation schedules with the Owner.
 - b. Installation shall be performed by manufacturer's personnel trained and certified in manufacturer's methods and procedures.
 - c. The signage contractor shall submit a CAD generated location plan noting the location of all signage and cross referenced to message schedule or plots for architect's approval.
 - d. Installer to conduct a pre-installation survey prior to manufacturing to verify copy and sign location. Each location shall be noted using a low tack vinyl reproduction of actual sign. Full scale renderings of directories and directionals shall also be provided. Any location discrepancy or message issues shall be submitted to architect for review.
 - e. Signs shall be level, plumb, and at heights indicated with sign surfaces free from defects.
 - f. Upon completion of the work, signage contractor shall remove unused or discarded materials, containers and debris from site.
- E. Exterior Door Signs: Mechanically fasten. Adhesive tape is not approved or acceptable.
- F. Graphic Film: Prepare substrate indicated in accordance with manufacturer's recommendations. Install over substrate indicated in accordance with manufacturer's recommendations.
- G. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.

- 1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of the plaque. Set in pre-drilled holes filled with quick-setting cement.
- H. Building Lettering: Mount letters onto building using the standard method recommended by the manufacturer for the type of surface indicated.
 - 1. Concealed Mounting: Unless recommended otherwise by manufacturer, mount the letters by inserting threaded studs into tapped lugs on the back of the letters. Set in pre-drilled holes filled with quick-setting cement.
 - a. At cementitious cladding system, mount studs through cladding panel and into steel blocking.

3.03 PROTECTION

A. Protect from damage until Substantial Completion; repair or replace damaged items.

SECTION 102113.19 PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid Plastic (HDPE) Toilet Compartments.
- B. Urinal _____ screens.

1.02 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 061000 Rough Carpentry: Blocking and supports.
- D. Section 102800 Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

- A. See Section 013000 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 (<u>x</u> mm) in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle compartments as recommended by manufacturer to protect from damage.

1.07 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

2.01 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. Global Partitions; "Solid Plastic (HDPE)"; www.globalpartitions.com.
 - 2. Scranton Products (Santana/Comtec/Capital); "Hiny Hiders Partitions" [Basis of Design]: www.scrantonproducts.com.
 - 3. Substitutions: Section 016000 Product Requirements.

2.02 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 (25 mm).
 - 2. Width: 24 inch (610 mm).
 - 3. Width for Handicapped Use: 36 inch (915 mm), out-swinging, unless drawings indicate otherwise.
 - 4. Height: 66 inch (____ mm).
- C. Panels:
 - 1. Thickness: 1 inch (25 mm).
 - 2. Height: 66 inch (____ mm).
 - 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.

2.03 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.

2.04 ACCESSORIES

- A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 in (75 mm) 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 (25 x 38 mm) 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.
 - 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

3.01 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.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1/2 inch (9 to 13 mm) 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.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- 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.

SECTION 102239 FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

1.02 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Wood blocking and track support shimming.
- B. Section 062000 Finish Carpentry: Product requirements for plastic laminate finish for installation by this section.
- C. Section 099123 Interior Painting: Field applied paint finish to panels.

1.03 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 C1396/C1396M Standard Specification for Gypsum Board; 2017.
- D. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- E. ASTM E413 Classification for Rating Sound Insulation; 2022.
- F. ASTM E557 Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).
- G. ASTM E596 Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2022.
- H. ASTM F793/F793M Standard Classification of Wall Coverings by Use Characteristics; 2020.
- I. UL (FRD) Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.
- C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
- D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.
- E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.
- F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
- G. Manufacturer's Instructions: Indicate special procedures.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.07 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within five year period after Date of Substantial Completion.
- C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Folding Panel Partitions Horizontal Opening:
 - 1. Kwik-Wall Company; 2000 Series Operable Walls: www.kwik-wall.com/#sle.
 - 2. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.
 - 3. Substitutions: See Section 016000 Product Requirements.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

- A. Folding Panel Partitions: Center opening; paired panels; side stacking; manually operated.
- B. Panel Construction:
 - 1. Frame: 16 gauge, 0.0598 inch (1.52 mm) thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
 - 2. Substrate: Gypsum board.
 - 3. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
 - 4. Hinges: Continuous piano type, ____ gauge, ____ inch (_____ mm) stainless steel.
 - 5. Panel Properties:
 - a. Thickness With Finish: 4 inches (100 mm).
 - b. Width: Standard width.
 - c. Weight: 8 lb/sq ft (40 kg/sq m).
- C. Panel Finishes:
 - 1. Facing: Vinyl coated fabric.
 - 2. Exposed Metal Trim: Custom powder coated paint finish.
- D. Panel Seals:
 - 1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
 - 2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.
- E. Suspension System:
 - 1. Track: Formed steel; 1-1/4 by 1-1/4 inch (32 by 32 mm) size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
 - 2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Performance:
 - 1. Acoustic Performance:
 - a. Noise Reduction Coefficient (NRC): ASTM E596, NRC of 0.65 minimum.
 - b. Sound Transmission Class (STC): 38 to 42 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100

sq ft (9.3 sq m).

- 2. Fire Rating: UL (FRD) Assembly No. _____ for one hour rating.
- 3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Accessories:
 - 1. Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments, and intermediate meeting posts.
 - 2. Pocket Enclosures: Door, frame, and trim to match adjacent walls.

2.03 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch (9.5 mm) thick, maximum permissible length; ends square cut, square edges.
- C. Fire Rated Gypsum Board: ASTM C1396/C1396M, Type X, UL rated; 1/2 inch (12.7 mm) thick, maximum practical length; ends square cut, square edges.
- D. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.
- E. Acoustic Insulation:
 - 1. Type: As required for acoustic performance indicated.
 - 2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.
- C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch (6.4 mm) of required position and parallel to the floor surface.
- D. Verify floor flatness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.
- E. Verify wall plumbness of 1/8 inch in 10 feet (3 mm in 3 m), non-cumulative.

3.02 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Lubricate moving components.
- C. Install acoustic sealant to achieve required acoustic performance.
- D. Coordinate electrical connections.

3.03 ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

SECTION 102600 WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.
- B. Protective wall covering.

1.02 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, bumper rails, and protective corridor handrails.
 - 2. Submit two samples of protective wall covering, 6 by 6 inches (152 by 152 mm) square.
- D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention, and _____.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 1. See Section 016000 Product Requirements, for additional provisions.
- G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.05 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.
- C. Installer Warranty: Provide 5-year warranty for metal crash rails commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Construction Specialties, Inc; Acrovyn Solid Color and Chameleon Crash Rails: www.c-sgroup.com/#sle.
 - 2. Inpro; _____: www.inprocorp.com/#sle.(Basis of Design)
 - 3. Koroseal Interior Products; ____: www.koroseal.com/#sle.
- B. Protective Wall Covering:
 - 1. Construction Specialties, Inc; Acrovyn High-Impact Wall Covering: www.c-sgroup.com/#sle.
 - 2. Inpro; _____: www.inprocorp.com/#sle. (Basis of Design)
 - 3. Substitutions: See Section 016000 Product Requirements.

2.02 PRODUCT TYPES

- A. Corner Guards Surface Mounted:
 - 1. Material: High impact vinyl with full height extruded aluminum retainer.
 - 2. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
 - 3. Performance: Resist lateral impact force of 100 lbs (445 N) at any point without damage or permanent set.
 - 4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 5. Width of Wings: 2 inches (51 mm).
 - 6. Corner: Square.
 - 7. Color: As selected from manufacturer's standard colors.
 - 8. Length: One piece.
 - 9. Preformed end caps.
- B. Protective Wall Covering:
 - 1. Thickness: 0.040 inch (1.02 mm).
 - 2. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 3. Color: As selected from manufacturer's standard colors.
 - Accessories: Provide manufacturer's standard color-matched trim and moldings.
 a. Inside Corner Trim: Standard angle
 - b. Outside Corner Trim: Standard angle.
 - 5. Mounting: Adhesive.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard above wall base to height noted on drawings
- C. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
- D. At joints indicated to be caulked, allow for a minimum 1/16 inch (1.6 mm) wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
- E. Use a roller to ensure maximum contact with adhesive.
- F. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

A. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

SECTION 102800 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. Childcare accessories
 - 3. Underlavatory guards
 - 4. Custodial accessories

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.
- 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.

1.08 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

2.01 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.

2.02 MANUFACTURER

- A. Basis-of-Design Products: Subject to compliance with requirements, provide the listed Basisof-Design Products.
 - 1. Bobrick Washroom Equipment, Inc. (Basis-of-Design Product Manufacturer)

2.03 SLOAN VALVE COMPANY (SOAP DISPENSERS ONLY)

- A. Koala (Childcare Accessories Only)
- B. 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.

2.04 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue Dispenser (Standard Roll): TA01
 - 1. Basis-of-Design Product: Bobrick B-2840
 - a. Description: Double-roll dispenser with utility shelf.
 - b. Mounting: Surface mounted.
 - c. Operation: Non-control delivery with theft-resistant spindle.
 - d. Capacity: Up to 5 1/2-inch diameter tissue rolls.
 - e. Material and Finish: Stainless steel, No. 4 satin finish, with high impact, black, polystyrene spindles.
- B. Combination Towel Dispenser/Waste Receptacle (Folded): TA16
 - 1. Basis-of-Design Product: Bobrick B-43944
 - 2. Description: Combination unit for dispensing C-fold or multifold towels, with removable trash liner holder and "towel mate" device that allows single towel dispensing without bulging, sagging, or falling through towel tray opening
 - 3. Mounting: Recessed with projecting receptacle.
 - 4. Mounting Depth: 4 inches, minimum (6 inch stud space required).
 - 5. Minimum Capacity
 - a. Towel Dispenser: 600 C-fold or 800 multifold paper towels.
 - b. Waste Receptacle: 15 gallon.
 - c. Material and Finish: Stainless steel, No. 4 satin finish.
 - d. Waste Receptacle Profile: Arc-front.
 - e. 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.
 - f. Locking: Two keyholes over studs on bottom and two tamper resistant screws at top.
- C. Soap Dispenser, Liquid Type, Manual: TA18
 - 1. Basis-of-Design Product: Bobrick B-4112
 - 2. Description: Manually Operated Liquid Soap Dispenser.
 - 3. Mounting: Wall mount, surface.
 - 4. Capacity: 40 oz.
 - 5. Body Construction: Drawn, one-piece, seamless construction.
 - 6. Materials: Stainless steel, No. 4 satin finish.

- 7. Valve Assembly: Black molded plastic push button. Soap head-holding mushroom valve. Stainless steel spring. U-packing seal and duckbill.
- 8. Lockset: Locking device requiring special key to open.
- 9. Refill Indicator: Window type.
- 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.
 - 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. Mirror, Framed, without Shelf: TA30
 - 1. Basis-of-Design Product: Bobrick B-166-1836
 - 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: 18 inches wide x 36 inches high.
- H. 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.
- I. 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.

2.05 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.

2.06 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.

2.07 CUSTODIAL ACCESSORIES

- A. Mop and Broom Holder: TA95
 - 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.

2.08 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), 0.036inch (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 tamperand-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.

2.09 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

3.01 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.

3.02 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.

SECTION 105613 METAL STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Four post shelving.

1.02 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
- C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
- D. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
 - 1. Indicate methods of achieving specified anchoring requirements.
- E. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

1.04 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Four Post Shelving:
 - 1. ASI Storage Solutions; ____: www.asi-storage.com/#sle.
 - 2. Hallowell; ____: www.hallowell-list.com/#sle.
 - 3. List Industries, Inc; _____: www.listindustries.com/#sle.
 - 4. Penco Products, Inc; : www.pencoproducts.com/#sle.
 - 5. Substitutions: See Section 016000 Product Requirements.

2.02 SHELVING - GENERAL

- A. See drawings for layout and sizes.
- B. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
 1. Provide hardware of type recommended by manufacturer for substrate.

2.03 FOUR POST SHELVING

- A. Four Post Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
 - 1. Unit Width: As noted on drawings.

- 2. Shelf Capacity: Uniform distributed load of 50 psf (2.4 kPa), minimum.
- 3. Finish: Baked enamel, medium gloss.
- 4. Color: As selected by Architect from manufacturer's standard range.
- 5. Number of Units: As indicated on drawings.
- B. Posts and Beams: Formed sheet members; perforations exposed on face of members are not acceptable.
 - 1. Metal Thickness: 16 gauge, 0.0598 inch (1.52 mm).
 - 2. Post Shape: Tee intermediate posts, angle end posts forming corners.
 - 3. Post Face Width: 2 inches (51 mm), maximum.
 - 4. Connecting Hardware: Manufacturer's standard.
- C. Bracing: Formed sheet members.
 - 1. Back Sway Bracing: Either strap or panel; at back of each unit.
 - 2. Side Sway Bracing: Either strap or panel; at each side of each unit.
 - 3. Strap Sway Bracing: One strap installed diagonally, 16 gauge, 0.0598 inch (1.52 mm); welded, riveted, or bolted to uprights.
 - 4. Panel Sway Bracing: Formed sheet metal panels, 20 gauge, 0.0359 inch (0.91 mm); welded, riveted, or bolted to uprights.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
- C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- D. Out-Of-Square Tolerance Four Post Shelving: Maximum of 1/8 inch (3 mm) difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.02 CLEANING

A. Clean shelving and surrounding area after installation.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

SECTION 116623 GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basketball backboards, goals, and support framing.
- B. Floor anchors for tensioned elements.
- C. Floor sleeves for net and goal posts.
- D. Wall mounted protection pads.
- E. Volleyball nets and posts.

1.02 RELATED REQUIREMENTS

- A. Section 033000 Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.
- B. Section 096466 Wood Athletic Flooring: Gymnasium flooring.
- C. Section 096566 Resilient Athletic Flooring: Gymnasium flooring.
- D. Section 260583 Wiring Connections.

1.03 REFERENCE STANDARDS

- A. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.
- B. AWS D1.1/D1.1M Structural Welding Code Steel; 2020, with Errata (2023).
- C. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 101 Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Electrical characteristics and connection locations.
 - 2. Fire rating certifications.
 - 3. Manufacturer's installation instructions.
- C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.
- D. Operating and maintenance data for each operating equipment item.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
- B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gymnasium Equipment:
 - 1. Draper, Inc; ____: www.draperinc.com/#sle.
 - 2. Performance Sports Systems; ____: www.perfsports.com/#sle.
 - 3. Porter Athletic Equipment Company; ____: www.porterathletic.com/#sle.
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 GENERAL REQUIREMENTS

- A. See drawings for sizes and locations, unless noted otherwise.
- B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
 - 1. National Federation of State High School Associations (NFHS) sports rules.
- C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.
- D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
- E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.
- F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL

- A. Basketball System: Backstop assembly, backboard, and goal.
 - 1. Manufacturers:
 - a. ADP Lemco, Inc; ____: www.adplemco.com/#sle.
 - b. Draper, Inc; ____: www.draperinc.com/#sle.
- B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fanshaped backboards.
 - 1. Framing: Center strut; side folding framing.
 - 2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
 - 3. Height Adjuster: Raises or lowers assembly by 2 feet (610 mm) to adjust goal height.
 - 4. Framing Color: As selected from manufacturer's standard selection.
 - 5. Manufacturers:
 - a. Substitutions: See Section 016000 Product Requirements.
- C. Backboards: Tempered glass, rectangular shaped.
 - 1. Frame: Brushed aluminum edge, steel mounting.
 - 2. Provide conversion frame, mountable on both assemblies designed for fan shaped backboards and assemblies designed for rectangular backboards.
 - 3. Markings: Painted.
 - 4. Provide safety padding for bottom edge of backboard.
 - 5. Provide mounting kit.
 - 6. Color: As selected from manufacturer's standard selection.
- D. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
 - 1. Net Attachment Device: Tube-tie.
 - 2. Breakaway mechanism, adjustable.

3. Finish: Powder coat orange.

2.04 FLOOR-MOUNTED EQUIPMENT

- A. Volley Ball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
 - 1. Posts: 3-1/2 inch (89 mm) O.D. schedule 80 aluminum tube with 1 inch (25 mm) height adjustments between 42 and 96 inches (1.07 and 2.4 m).
 - 2. Net: 4 inch (101 mm) square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
 - 3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
 - Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.
 a. Color: ______.
- B. Floor Anchors for Portable Gymnasium Equipment: Steel plate bolted into wood flooring, with center screw-down button for securing tensioned elements; installed flush with finish floor surface.
 - 1. Specific equipment items to be anchored have not yet been determined; _____ anchors in gymnasium floor are required.
 - 2. Anchors will be furnished by Owner and installed by Contractor.
 - 3. Screw Size: 1/2 inch (12.7 mm) diameter, with 13 threads per inch.
 - 4. Manufacturers: a. ADP Lemco, Inc; : www.adplemco.com/#sle.
- C. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
 - 1. Latch Cover: Brass, round; tamper resistant lock with key.
 - 2. Sleeve: Steel.
 - 3. Depth of Sleeve: 9 inches (230 mm) from floor surface to bottom, including latch cover.

2.05 WALL PADDING

- A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
 - 1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
 - 2. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
 - a. Color: As selected from manufacturer's standard range.
 - b. Texture: Embossed leather-look.
 - c. Fabric Weight: 14 oz/sq yd (0.52 kg/sq m), minimum.
 - 3. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf (90 kg/cu m) nominal density.
 - 4. Foam Thickness: 1-1/2 inches (38 mm).
 - 5. Backing Board: Plywood.
 - a. Thickness: 3/8 inch (9.5 mm), minimum.
 - 6. Fastening Margins: 1 inch (25 mm) wide, covered by fabric covering.
 - 7. Mounting: Removable; Z-clips fixed to wall and to padding.
 - 8. Manufacturers:
 - a. Draper, Inc; EcoVision Wall Pad: www.draperinc.com/#sle.
 - b. IPI by Bison, Inc; Indoor Solid Color Vinyl Padding: www.ipibybison.com/#sle.
 - c. Substitutions: See Section 016000 Product Requirements.
- B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:

- 1. I-beams.
- 2. Wall corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

- A. Install in accordance with Contract Documents and manufacturer's instructions.
- B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.
- C. Install equipment rigid, straight, plumb, and level.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.
- F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.04 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

SECTION 123219 LAMINATE CASEWORK

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.
- 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".

1.04 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.

1.05 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.

1.06 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.

1.07 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.

1.08 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
 - 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.

1.09 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 of 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

2.01 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.

2.02 MATERIALS

- A. Core Materials:
 - 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.

2.03 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.

2.04 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:
 - 1. Wire pulls equivalent to Stanley No. 4484, stainless steel, satin finish (ANSI B12012), 4inches 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:
 - 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.

2.05 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.
 - 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
 - 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.
 - 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.

3.06 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.

SECTION 124813 ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum entrance floor grilles.

1.02 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.
- C. Shop Drawings: Indicate dimensions and details for recessed frame.
- D. Maintenance Data: Include cleaning instructions, _____, and stain removal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Entrance Floor Grilles and Gratings:
 - 1. Construction Specialties, Inc; Entrance Grids: www.c-sgroup.com/#sle.
 - 2. Substitutions: See Section 016000 Product Requirements.

2.02 ENTRANCE FLOOR GRILLES AND GRATINGS

- A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with nominal 1 inch (25 mm) wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
 - 1. Recess Depth: 3/4 inches (19 mm).
 - 2. Length in Direction of Traffic Flow: 72 inches (1830 mm).
 - 3. Width Perpendicular to Traffic Flow: Full width of entrance door opening.
 - 4. Frame: Anodized aluminum for embedding in concrete; minimal exposed trim; stud or hook concrete anchors.
- B. Mounting: Top of non-resilient members level with adjacent floor.
- C. Structural Capacity: Capable of supporting a rolling load of 500 pounds (226.8 kg) without permanent deformation or noticeable deflection.
- D. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

2.03 FABRICATION

- A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.
- B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.02 PREPARATION

- A. Mats: Verify size of floor recess before fabricating mats.
- B. Vacuum clean floor recess.

3.03 INSTALLATION

A. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.04 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch (6 mm). **END OF SECTION**

DIVISION 21 – FIRE SUPPRESSION

21 05 00 – GENERAL PROVISIONS – FIRE SUPPRESSION 21 10 00 – MATERIALS AND METHODS – FIRE SUPPRESSION 21 40 00 – FIRE SUPPRESSION



02-08-2024
SECTION 21 05 00

GENERAL PROVISIONS – FIRE SUPPRESSION

PART 1 – GENERAL

1.1 SCOPE:

- A. Provisions of this Section apply to all Fire Protection work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all Fire Protection work shown or specified, complete and ready for operation, consisting in general of the following:
 - 1. Provide wet automatic sprinkler system coverage for the building.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the Fire Protection work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. Permitting is required for sprinkler system flush-out water discharged to surface waters.

The State Contact: Alabama Department of Environmental Management Attn: Water Division Post Office Box 301463 Montgomery, Alabama 36130-1463 Telephone Number: (334) 271-7823 Fax Number: (334) 279-3051 E-Mail: H2omail@adem.state.al.us

F. "Provide" means to furnish and install, complete and ready for operation.

1.2 DRAWINGS:

- A. Fire Protection Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. Fire Protection Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale Fire Protection drawings for location of system components.

- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or miss-located work in proper manner.
- D. DO NOT scale drawings to locate sprinkler heads. COORDINATE with lighting and ceiling grids. Contractor for Fire Protection work is responsible for coordinating with all trades.

1.3 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/B31.9 Code for Building Services Piping
 - 2. NFPA 13 Standard for the Installation of Sprinkler Systems
 - 3. NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances
 - 4. NFPA 25 Standard for Inspection, Testing, and Maintenance of Water-based Fire Protection Systems.
 - 5. NFPA 70 National Electrical Code
 - 6. NFPA 101 Safety to Life from Fire in Buildings and Structures
 - 7. Other standards as referenced in other sections of Division 210000
 - 8. 2009 International Building Code
 - 9. 2009 International Mechanical Code

1.4 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The Fire Protection sub-contractor shall meet the following minimum qualifications:
 - 1. He shall have been in business as a Contractor for Fire Protection work continuously, for at least 3 years prior to the date of opening bids for this project.
 - 2. He shall have a satisfactory experience record with Fire Protection installations of character and scope comparable with this project and shall have completed three such installations in the past three years.
 - 3. He shall be qualified, certified and licensed by the State of **Alabama** Fire Marshal. He shall meet all laws pertaining to fire protection in the Code of **Alabama** 1975 and any amendments of same.

1.5 CONFLICTS AND INTERFERENCES:

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.
- B. Coordinate with all other trades in regards to location and arrangement of all sprinkler system components.

1.6 WORKMANSHIP:

A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.7 COOPERATION:

A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.8 VISITING SITE:

A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

1.9 MATERIALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.

- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

1.10 SHOP DRAWINGS:

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of piping) and drawn to 1/4" to 1'-0" scale.
- B. Submit pdf of working shop drawings, material data, and hydraulic calculations. Shop drawings shall include drain locations, pipe slopes down to drains, piping elevations, piping connection details, and a list of piping materials. All shop drawings shall be produced using AutoCad and a copy of the shop drawing files shall be provided in AutoCad 2013 format on CD-ROM disks for shop drawing review. A CD-ROM with a copy of all approved shop drawings shall be provided for project closeout.
 - 1. Complete Fire Protection equipment plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
 - 2. Equipment piping.
- C. Thirty days before starting work, submit Fire Protection shop drawings bearing seals of approval of Owner's Underwriters and all Governmental Agencies having jurisdiction. Complete shop drawings are required to be submitted at one time. (See Section 214000.)
- D. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.

1.11 RECORD DRAWINGS:

A. When work starts the Architect will furnish two complete sets of white prints of the Fire Protection Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.

- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
 - 2. Block out areas modified by change-order & identify them by change-order number.
 - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor for a service fee of \$100.00 per CAD/electronic drawing sheet file and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions. Include the contract drawings equipment schedules, details, and sections, edited to show actual completed conditions. When record drawings are complete, provide 2 sets of bond prints, and one complete set of AutoCAD drawing files (AutoCAD 2016 format) and one set of PDF drawing files on CD-ROM disks.
- D. Fire Protection Drawings shall be a set of CAD shop drawings, up-dated to show actual conditions at completion of work. Include the contract drawings equipment schedules and details edited to show actual completed conditions.

1.12 **PROTECTION OF EQUIPMENT:**

- A. During construction, protect Fire Protection piping and equipment damage or deterioration and prevent water, dust, etc. from entering the equipment.
- B. During construction, keep all openings of piping and equipment securely covered to prevent entry of water or dust.
- C. When installation is complete, clean piping and equipment and make ready for painting.

1.13 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. *Provide space at all equipment power and control panels as required by local codes.*
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.

2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

1.14 EQUIPMENT SUPPORTS:

A. Provide supports for piping and equipment. Hot dip galvanize after fabrication all supports, etc., located outdoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.

1.15 CUTTING AND PATCHING AND INCIDENTAL WORK:

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish Fire Protection Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Provide all motors incidental to the Fire Protection systems. Wiring of motors, switches and starters is included in "Electrical Sections".
- D. Furnish motor starters as specified below.

1.16 EXCAVATION & BACKFILLING:

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

1.17 SLEEVES:

- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.

- C. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetration Firestop Systems where included in the contract documents. Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (mechanical rooms, etc.).
- F. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

1.18 VALVE TAGS:

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
 - 1. Fire Protection: White tags with red numbers.
- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).
- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing buildings extend existing sequences.

1.19 VALVE CHARTS:

A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.

1.20 EQUIPMENT IDENTIFICATION:

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under this division.

- C. Secure nameplates with acorn head screws.
- D. Colors:
 - 1. Equipment connected to utility power only black letters on white nameplates.
 - 2. Equipment connected to emergency power red letters on white nameplates.

1.21 ACCESS DOORS:

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

1.22 TESTS, CLEANING & ADJUSTMENTS:

- A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.
- B. After systems have been installed complete, adjust and test systems for proper operation. *All instruments used for testing work shall have been calibrated within 6 months and checked for accuracy prior to start of work.*
- C. Perform all tests as required by local codes. Contractor shall furnish testing equipment. *All piping pressure tests shall be hydrostatic tests.*
- D. If local codes are more stringent than the following, local codes shall govern.

1.23 WARRANTY & INSTRUCTIONS:

- A. See General Conditions One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. After completion of the work, Contractor shall operate the equipment which he installs for a period of (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.

D. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.

1.24 PROJECT CLOSE-OUT:

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. Record drawings Fire protection systems: PDF files and CAD files.
 - 2. Equipment Submittal Data PDF files.
 - 3. Equipment operating and maintenance manuals PDF files.
 - 4. Maintenance schedule.
 - 5. Equipment warranty dates and guarantees.
 - 6. List of Owner's Personnel who have received maintenance instructions.
 - 7. Test results of fire protection systems and names of those witnessing test. (See Section 214000 and NFPA 25 for testing requirements.)
 - 8. Install valve charts in Mechanical Rooms.

1.25 TRAINING OF OWNER PERSONNEL:

- A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
- B. The Engineer shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
 - 1. The Fire Protection Engineer shall determine the special needs and areas where training will be most valuable. The Owner and Engineer shall decide how rigorous the training should be for each piece of commissioned equipment. The Fire Protection Engineer shall communicate the results to the Subs and vendors who have training responsibilities.
 - 2. Each Sub and vendor responsible for training shall submit a written training plan to the Fire Protection Engineer for review and approval prior to training. The plan will cover the following elements:
 - a. Equipment (included in training)
 - b. Intended audience
 - c. Location of training
 - d. Objectives

- e. Subjects covered (description, duration of discussion, special methods, etc.)
- f. Duration of training on each subject
- g. Instructor for each subject
- h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
- i. Instructor and qualifications
- 3. The General Contractor shall develop an overall training plan and shall coordinate and schedule, with the Subcontractors and other consultants, the overall training for the commissioned systems. The Engineer will recommend approval of the training to the Owner upon satisfactory completion using a standard approval form. The Owner and Contractors sign the approval form.
- 4. Video taping of the training sessions will be provided at the Owners request.
- C. Fire Protection Contractor. The Fire Protection Contractor shall have the following training responsibilities:
 - 1. Provide the Fire Protection Engineer and Owner with a training plan two weeks before the planned training.
 - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
 - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
 - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
 - 6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 - 7. Training shall include:
 - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

- b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
- c. Discussion of relevant health and safety issues and concerns.
- d. Discussion of warranties and guarantees.
- e. Common troubleshooting problems and solutions.
- f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
- g. Discussion of any peculiarities of equipment installation or operation.
- h. Classroom sessions shall include the use of overhead projections, slides, video/audiotaped material as might be appropriate.
- 8. The Fire Protection contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls.
- 9. Training shall occur after functional testing is complete, unless approved otherwise by the Owner.
- 10. Minimum Duration of Training. The Fire Protection contractor shall provide training on each piece of equipment according to the following schedule.

<u>Hours</u>	<u>System</u>
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- .5 Piping Systems
- .5 Fire Protection System
- .5 Fire Sprinklers

END OF SECTION

SECTION 21 10 00

MATERIALS AND METHODS – FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SCOPE:

A. Section 210500 - "General Provisions – Fire Suppression" shall apply to and become part of this Section.

PART 2 - MATERIALS: Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.

2.1 **PIPE HANGERS**:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Pipe hangers for piping 4" and larger: adjustable wrought clevis hangers.
- E. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- F. Provide riser clamps on pipe risers on each floor.
- G. Beam Clamps: Anvil Fig. 92.
- H. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- I. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- J. Size rods for pipe hangers per NFPA 13.
- K. Space pipe hangers per NFPA 13.

2.2 GAUGES:

A. Install 4-1/2" dial pressure gauges per NFPA 13. Gauges shall have bronze or stainless steel bourdon tubes, 316 stainless steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy Grade 2A not less than 1/2% of full scale over the entire range, without mounting flange. Gauges shall be Ashcroft 1279, Marsh Series P01, Trerice 450-B, Weksler AA44-2 or U.S. Gauge 1980L with minimum bourdon tube diameter of 3". Provide ball valves for all pressure gauges. Provide siphons for steam gauges.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION:

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- C. Install drains from low points and inspector's test in fire protection piping to approved points, whether shown or not.
- D. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- E. Lay underground fire protection piping so top of pipe is at least 30" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- F. Run no piping in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.
- G. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetrations Firestop Systems where included in the contract documents, Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation.
- H. The firestop systems provided shall resist the spread of fire, resist the passage of smoke and other gases.
- I. Provide U.L. classified through-penetration firestop system for each penetration in accordance with manufacturer's guidelines.

END OF SECTION

SECTION 21 40 00

FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SCOPE:

- A. Section 21 05 00 "General Provisions Fire Suppression" and Section 21 10 00 "Materials and Methods Fire Suppression" shall apply to and become part of this Section.
- B. It is the Contractor's responsibility to verify flow test data prior to ordering any equipment. If results do not meet demand, he is to notify the Architect prior to preparing shop drawings. If the test is more than one year old, the Contractor shall have the system retested.

1.2 SHOP DRAWINGS:

- A. Hydraulic calculations and sprinkler shop drawings for building fire protection systems must be prepared under the supervision of an engineer licensed in the State of (*Alabama*). Layout to show precise locations and elevations of sprinkler heads and piping with sizes indicated. Coordinate location of piping and sprinkler heads with other work, including piping, ducts, diffusers and lighting fixture layout. When submitted to Architect, drawings and calculations shall bear the stamps of approval from Owner's Underwriter and local Fire Marshal's office.
- B. Prepare shop drawings: (Shop drawings, hydraulic calculations and material data may be submitted in PDF format electronically by e-mail)
- C. State on drawings: Hose threads match the Local Fire Department Equipment.

1.3 CODES:

A. Provide all equipment, piping, valves, fire and jockey pumps, switches and complete operating system to standard of NFPA 13 in compliance with local, county and state authorities, Owner's Underwriter, and these Specifications.

1.4 SERVICE:

A. Coordinate with Civil and provide for connection at approximately 5 feet outside of building.

1.5 HYDROSTATIC TESTING:

A. Fire protection piping tests: Test in accordance with NFPA 13, and 25. Architect, Owner's Underwriters and local Fire Marshal shall witness tests. Provide certificate of inspection to the Architect including the names of those witnessing the test.

- B. In addition to the standard hydrostatic test, all dry piped systems shall require an air pressure leakage test at 40 psi to be conducted for 24 hours. Any leakage that results in a loss of pressure shall be corrected prior to performing the hydrostatic test.
- C. On completion of installation test all piping and attached appurtenances subjected to system working pressure at 200 psi or 50 psi in excess of the system working pressure, whichever is greater, the system shall maintain that pressure for 2 hours. Pressure loss shall be determined by a drop in gauge pressure or visual leakage. The test pressure shall be read from one of the following, located at the lowest elevation of the system or the portion of the system being tested:
 - 1. A gauge located at one of the hydrant outlets
 - 2. A gauge located at the lowest point where no hydrants are provided
- D. To reduce the possibility of serious water damage in case of a break, pressure can be maintained by a small pump, the main controlling gate meanwhile being kept shut during the test.
- E. Hydrostatic tests should be made before the joints are covered so that any leaks can be readily detected.
- F. The test procedure is as follows: Apply additional pressure, by temporary pump or compressed air connection. The water pressure is to be increased in 50 psi increments until the test pressure described above is attained. After each increase in pressure, observations are to be made of the stability of the joints. These observations are to include such items as protrusion or extrusion of the gasket, leakage, or other factors likely to affect the continued use of a pipe in service. During the test, the pressure is not to be increased to the next increment until the joint has become stable. This applies particularly to movement of the gasket. After the pressure has been increased to the required maximum value and held for 1 hour, the pressure is to be decreased to 0 psi while observations are made for leakage. The pressure is again to be slowly increased to the value specified above and held for 1 more hour while observations are made for leakage.
- G. Loss shall be determined by a drop in gauge pressure or visual leakage.
- H. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

PART 2 - PRODUCTS Unless otherwise noted, provide new, standard, first-grade materials throughout. Unless otherwise noted, all products and materials shall be manufactured in the U.S.A. This shall include but not limited to: Pipe, fittings, hangers, valves, switches, gauges, sprinklers, pumps and all other associated equipment.

2.1 GENERAL:

A. Refer to Electrical Drawings and Specifications for alarms, wiring of supervisory switches and related equipment.

2.2 FIRE PROTECTION PIPING:

A. System shall comply with NFPA 13.

- B. All fire protection piping within building: black steel. All underground fire protection piping outside building: ductile iron. All fire protection piping above ground on outside of building: galvanized. Use of CPVC fire protection piping is not approved and must be pre-approved for use by the Owner in writing. Any CPVC fire protection piping installed without pre-approval in writing will be replaced with specified material at contractor's expense.
- C. Black steel pipe: schedule 40, ASTM A-53, A-106 or A-135. Fittings on piping 2" and smaller black malleable iron or cast iron 175 lb., screwed ANSI B 16.4 or B 16.3; piping fittings 2-1/2" and larger, welded fittings, ANSI B 16.9 or Victaulic, Anvil or Gustin Bacon fittings for roll grooved pipe, ASTM A-47. Where allowed by NFPA 13 and Owner's Underwriter, schedule 10 black steel pipe with roll groove may be substituted.
- D. Ductile iron pipe: cement lined, ANSI A 21.50.
- E. Joints on black steel screwed piping: Make up with Teflon tape applied to male threads.
- F. Joints on black steel welded piping: Comply with ANSI standard. B 16.9 and B 16.25.
- G. Joints on black steel grooved piping: Victaulic, Anvil or Gustin Bacon couplings, ASTM-A-47. Note: Victaulic #920 or #922 Mechanical T's are approved for use only where connections to existing systems are required. All joints must be cut or roll grooved.
- H. Joints on ductile iron piping: standard mechanical joint ANSI A21.11. Provide retainer glands on all fittings. Provide concrete thrust block, minimum 1 cubic yard, at all fittings. Thrust block must bear against virgin soil.
- I. Arrange for connection to existing water main, backflow preventer as required by local utility, service line from main to building as required by local utility. Pay all charges, fees, temporary deposits, etc.

2.3 **PIPE HANGERS**:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference.
- B. Pipe hangers for lines 8" and smaller: Anvil Fig. 69.
- C. Trapezes where required to bridge between structural members, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze.
- D. Provide riser clamps on pipe risers on each floor.
- E. Beam Clamps: Anvil Fig. 92.
- F. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- G. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- H. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe thru 3", 1/2" rods for 4", 5", 6" and 8", 5/8" rods for pipe 10" and larger.

I. Pipe hanger spacing for screwed, cut or roll groove joint and welded piping in strict accord with NFPA 13 . Install additional hangers at change of direction, valve clusters, and at ends of branch lines.

2.4 FIRE PROTECTION VALVES:

- A. Gate valves 2" and smaller: all bronze, 175 psig WP, UL listed, OS&Y, solid disc, Stockham B-133, Nibco T-104-0, Milwaukee Valve BB-SC100.
- B. Gate valve 2 1/2" and larger: iron body, bronze trim, flanged, 175 psig WP, UL listed, OS&Y, Stockham G-634, American Darling 55, Kennedy 68, Mueller A2073-6, Nibco F-607-0.
- C. Butterfly Valves: Central Figure 570 or 580 complete with supervisory switch for indoor or waterproof on exterior UL/FM approved.
- D. Check valves: iron body, bronze trim, 175 psig WP, UL listed, Stockham G-939, American Flow Control 50-SC, Kennedy 126, Mueller A2120-6, Nibco F-908-B.

2.5 SPRINKLER WATER FLOW INDICATOR AND SUPERVISORY SWITCHES:

- A. Underwriter approved paddle switch type water flow indicator, 120/1/60, two single pole, double throw contacts, one set for remote alarm, one set for alarm bell, complete with supervised cover on device. Automatic, Viking, or Anvil.
- B. Underwriter approved 6" electric bell, 120/1/60, or water motor alarm gong, paint exterior of bell as required by Architect.
- C. Supervisory switches, equal to Notifier Company Model NGV or SGV or Potter OSYSU-1 or -2 with NEMA 6P enclosure shall be used where subject to any condition where water is present, such as, in exterior vaults, complete with supervised cover on device. Potter waterproof switches must be used where installed outside building. All valves shall be supervised open. Provide with 2 sets of single pole double throw contacts.
- D. Verify location of any bells or alarms with Architect.

2.6 SPRINKLER HEADS:

- A. Sprinkler heads shall be (Quick Response) commercial type, U.L. listed by Reliable, Victaulic, Tyco, Viking, Globe or approved equal. Sprinkler heads shall be centered both directions in ceiling tile, located symmetrically in rooms and centered in corridors. Location of sprinklers to be approved by Architect.
- B. Provide quick response brass upright sprinklers in areas without ceilings.
- C. Provide quick response recessed pendent type sprinklers with removable escutcheons in areas with ceilings.
- D. Provide quick response concealed style pendent sprinklers with white cover plates where required.
- E. Where sidewall sprinklers are used provide quick response type.

- F. Existing pipe and fittings may be reused but all sprinklers within the contract limits shall be new and new sprinklers shall be quick response type. Contractor to verify that existing sprinkler in the same compartment with the new work are quick response type. Where sprinklers are found to be standard response replace with quick response type sprinklers. Sprinklers to match existing in appearance, i.e. color and concealment.
- G. Submit sample of any proposed equivalents in sprinklers prior to bid date. See Substitutions Section.
- H. Sprinklers subject to mechanical injury shall be protected with listed guards.

2.7 SPARE SPRINKLERS:

A. Provide sprinklers and all required items in cabinet per NFPA 13. Provide one sprinkler wrench for each type head.

2.8 EQUIVALENT MANUFACTURERS:

A. Where Croker/Standard is listed above Potter/Roemer, Elkhart, Guardian or Sierra may be utilized.

PART 3 - EXECUTION

3.1 PIPING:

- A. Provide drain piping to approved locations for all low points. Provide inspectors test piping to the building exterior at approved locations. Provide splash blocks for all exterior drains. (All drain piping to be galvanized.)
- B. Install using tradesmen certified in sprinkler pipe and system installations.
- C. Fire protection piping may be factory cut to lengths, but field modifications will be required to coordinate with other trades.

3.2 PERIODIC INSPECTION:

A. Make two periodic inspections within the first year after completion and acceptance of the work. Furnish a complete written report of each inspection to the Architect and the Underwriter.

END OF SECTION

DIVISION 22 – PLUMBING

22 05 00 – GENERAL PROVISIONS – PLUMBING 22 10 00 – MATERIALS AND METHODS – PLUMBING 22 15 00 – THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS 22 20 00 – PLUMBING FIXTURES AND EQUIPMENT



02-08-2024

SECTION 22 05 00

GENERAL PROVISIONS – PLUMBING

PART 1 – GENERAL

1.1 SCOPE:

- A. Provisions of this Section apply to all Plumbing work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all Plumbing work shown or specified, complete and ready for operation, consisting in general of the following:
 - 1. A system of sanitary drain, waste, and vent piping.
 - 2. A system of domestic water piping.
 - 3. Providing plumbing fixtures and equipment as shown on drawings.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the Plumbing work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- E. "Provide" means to furnish and install, complete and ready for operation.

1.2 DRAWINGS:

- A. Plumbing Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. Plumbing Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale Plumbing drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work in proper manner.
- D. Contractor for Plumbing work is responsible for coordinating with all trades.

1.3 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/B31.9 Code for Building Services Piping
 - 2. NFPA 70 National Electrical Code
 - 3. NFPA 90A Installation of Air Conditioning and Ventilating Systems
 - 4. NFPA 101 Safety to Life from Fire in Buildings and Structures
 - 5. Other standards as referenced in other sections of Division 22
 - 6. 2009 International Building Code
 - 7. 2009 International Plumbing Code
 - 8. 2009 International Mechanical Code
 - 9. 2009 International Energy Conservation Code

1.4 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The Plumbing Subcontractor shall meet the following minimum qualifications:
 - 1. He shall have been in business as a Plumbing Contractor for at least 3 years prior to the date of opening bids.
 - 2. He shall have a current Master Plumber's Certificate of competency issued by the State of **Alabama** and the City and County in which work occurs.
 - 3. He shall have a satisfactory experience record with Plumbing installation of character and scope comparable with this project and shall have completed three such installations in the past three years.
 - 4. If the Plumbing Subcontractor, with the Engineer's approval, uses a Sub-Subcontractor to provide another discipline that the Subcontractor does not normally furnish, that Sub-Subcontractor shall meet the same qualifications as the Subcontractor.

1.5 CONFLICTS AND INTERFERENCES:

A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.6 WORKMANSHIP:

A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.7 COOPERATION:

A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.8 VISITING SITE:

A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

1.9 MATERIALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. **Unless otherwise noted**, **all pipe**, **fittings and valves shall be made in the United States of America**.
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.

- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. All pressure vessels shall be constructed and tested in accordance with applicable ASME codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- H. Similar items of equipment shall be the product of the same manufacturer.

1.10 SHOP DRAWINGS:

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of piping) and drawn to 1/4" to 1'-0" scale.
 - 1. Complete Plumbing equipment plans showing location of equipment, floor drains, and equipment pads and foundations.
 - 2. Equipment piping.
 - 3. Plumbing piping.
- B. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.

1.11 COORDINATION SHOP DRAWINGS:

- A. Coordination shop drawings (2 sets of bond and PDF digital format files) will be drawn to a scale not smaller than 1/4" = 1'-0".
- B. Start drawings with HVAC shop drawings.
- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.
- D. Next, the Plumbing Contractor shall add all piping and plumbing to the drawings, indicating all equipment and piping. Indicate elevations of all piping. Draw sections as required to clarify congested situations.
- E. Next, the Fire Protection Contractor shall add all sprinkler heads and fire protection piping.
- F. Next, the Electrical Contractor shall add all electrical fixtures, conduit and equipment.

- G. Next, the drawings shall be submitted to the General Contractor for final coordination.
- H. Finally, after the General Contractor has approved the drawings they shall be submitted to the Architect for his review and comments.

1.12 **RECORD DRAWINGS**:

- A. When work starts the Architect will furnish two complete sets of white prints of the Plumbing Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
 - 2. Block out areas modified by change-order & identify them by change-order number.
 - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor for a service fee of \$100.00 per CAD/electronic drawing sheet file and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions.

1.13 **PROTECTION OF EQUIPMENT:**

- A. During construction, protect Plumbing equipment from damage or deterioration.
- B. When installation is complete, clean equipment and make ready for painting.

1.14 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. *Provide space at all equipment power and control panels as required by local codes.*
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.

- D. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

1.15 EQUIPMENT SUPPORTS:

- A. Provide supports for piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors. Prime coat and paint all grillage, supports, etc. located indoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all grillage, supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.
- B. Set floor-mounted equipment on concrete pads or platforms (as indicated) of height shown, but not less than 3-1/2" high. Chamfer pads 1". Extend pad 6" beyond equipment in all directions. Provide pads as follows:
 - 1. Water heaters: 6" high, No. 4 rebar 12" o.c. both ways.

1.16 CUTTING AND PATCHING AND INCIDENTAL WORK:

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish Plumbing Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Provide all motors incidental to the Plumbing systems. Wiring of motors, switches and starters is included in "Electrical Sections".

1.17 FLASHING:

- A. General: Furnish all pitch cups, metal base flashing and counter flashing required for Plumbing Work. Installation of above items is specified in Roofing Section.
- B. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- C. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- D. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".
- E. Vent Pipe and Roof Drain Flashing: Specified in "Roofing Section".

1.18 EXCAVATION & BACKFILLING:

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.

1.19 MOTORS, STARTERS & ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

1.20 SLEEVES:

- A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.
- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.
- C. For pipe passing through floors outside fire rated chases and fire rated wall and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Section Through-Penetrations Firestop Systems where included in the contract documents, Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for all conditions, bare pipe, insulated pipe, etc. For plastic piping material submittal must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (Plumbing rooms, toilets, etc.).

F. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

1.21 PAINTING:

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section. Gas piping shall be painted yellow unless otherwise noted.
- D. Prime and paint all grillage, supports, etc. located indoors, except where noted to be galvanized.
- E. Other painting is specified in Painting Section, Finishes Division.

1.22 PIPE IDENTIFICATION:

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. (Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.) Markers shall be equal to Craftmark, Brady, Seton or Brimar.
- B. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- C. Label Spacing and Extent:
 - 1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
 - 2. Wherever a pipe enters or leaves a room or building.
 - 3. At change of direction.
 - 4. At main valves and control valves (not equipment valves).
 - 5. At manifolds.
 - 6. On risers, just above and below floors.

1.23 VALVE TAGS:

- A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.
- B. Valve tag colors:
 - 1. Plumbing: Black tags with white numbers.

- C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).
- D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing buildings extend existing sequences.

1.24 VALVE CHARTS:

- A. In all mechanical rooms, provide charts showing number and locations of all labeled valves, type of service, etc. Laminate in heavy plastic and provide brass grommets for attaching to wall. Attach to wall with anchors and brass screws.
- B. In existing buildings include existing valves in the charts of new valves.

1.25 EQUIPMENT IDENTIFICATION:

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under Division 26.
- C. Secure nameplates with acorn head screws.
- D. Colors:
 - 1. Equipment connected to utility power only black letters on white nameplates.
 - 2. Equipment connected to emergency power red letters on white nameplates.

1.26 ACCESS DOORS:

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

1.27 TESTS, CLEANING & ADJUSTMENTS:

A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.

- B. After systems have been installed complete, adjust and test systems for proper operation and correct all noise or vibration conditions. Perform all tests as required by local codes. Contractor shall furnish testing equipment. *All piping pressure tests shall be hydrostatic tests.*
- C. If local codes are more stringent than the following, local codes shall govern.
- D. Sanitary Water Systems:
 - 1. Test piping by stopping lower outlets and filling with water to 10' hydrostatic head. Stop leaks and repeat test until watertight. All joints shall be exposed throughout test.
 - 2. Provide "Ball Test" on all piping 3" and larger with ball 1/2" smaller than pipe diameter.
- E. Domestic water piping: Test by applying pressure (by temporary pump or compressed air connection) to total hydrostatic pressure 1-1/2 times street pressure but not less than 150 psig for not less than 4 hours. Immediately and completely stop all leaks. On completion of roughing-in, cap all outlets, make connections with house supply line, and put under full water pressure. After testing, leave general pressure on until ready to install fixture (except when necessary to drain to avoid freezing during construction). After completion of all tests, repairs and installation of fixtures, flush all domestic hot and cold water piping with water to remove sediment and scale and then disinfect. Disinfect piping with hypochlorite solution of chlorine or compressed chlorine gas applied through an approved chlorinator. Operate valves and faucets several times to insure the chlorine reaches all parts of the system. Feed water and chlorination agent into the system at rates that will provide a residual chlorine content of not less than 50 ppm after a retention period of 6 hours. Upon completion of treatment, flush treated water from each system until the water supply is satisfactory to the public health authority having jurisdiction. Provide Architect a certificate of compliance from the local Health Department as required.
- F. Start-Up and Service:
 - 1. The Contractor and factory authorized service representative for the water heaters, shall place each item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period.
 - 2. In addition, submit equipment manufacturers' start-up reports for items listed above. See Paragraph "Project Close-Out", below.
 - 3. The Contractor shall balance all hot water pumps and circuit setters to flow shown on drawings. Balancing shall not be started until 1) Systems have been completed, including leak testing and cleaning and until systems have been refilled, pumps are rotating correctly, and strainers have been cleaned and baskets used for the ultimate installation have been installed, and 2) Expansion tanks have been installed and correct system pressure is being maintained, and system has been vented and is free from air.
 - a. Adjust circuit setters to meet design GPM requirements. Measure and record GPM.
 - b. Produce a report documenting the measured flows and submit three (3) copies of the report to the Architect.

1.28 WARRANTY & INSTRUCTIONS:

A. See General Conditions - One-Year Warranty.

- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.
- D. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- E. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.

1.29 **PROJECT CLOSE-OUT**:

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. Record drawings plumbing: PDF files and CAD files.
 - 2. Equipment Submittal Data PDF files.
 - 3. Equipment operating and maintenance manuals PDF files.
 - 4. Maintenance schedule.
 - 5. Equipment warranty dates and guarantees.
 - 6. Circulating hot water balance report.
 - 7. Certificate of disinfection of domestic water lines as required by local authority.
 - 8. Install valve charts in Mechanical Rooms.
 - 9. Submit factory start-up reports for:
 - a. Water heaters
 - 10. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

END OF SECTION

SECTION 22 10 00

MATERIALS AND METHODS – PLUMBING

PART 1 - GENERAL

1.1 SCOPE:

A. Section 22 05 00 - "General Provisions - Plumbing" shall apply to and become part of this Section.

PART 2 - MATERIALS: (Unless otherwise noted, all pipe, fittings and valves shall be manufactured in the United States of America)

NOTE: All materials used in systems that may be used for potable water shall meet the Reduction of Lead in Drinking Water Act.

2.1 SANITARY, WASTE AND VENT PIPING:

- A. Inside building to foundation wall: Vent piping: PVC-DWV plastic. Waste piping above floor: Cast iron, DWV copper, or PVC-DWV plastic. Piping below slab on grade: PVC-DWV plastic. Piping from discharge of equipment that will convey water at a temperature greater than 140°F shall be cast iron. Pipe exposed in mechanical rooms or housekeeping rooms shall be cast iron. Piping in return air plenums shall not be PVC.
- B. Outside building (from foundation wall to sewer provided under the Civil Section) 2'-0" or more below grade in non-traffic areas: PVC-DWV, or cast iron. Less than 2'-0" cover and in traffic areas: Cast iron or Ductile iron.
- C. Cast iron hub-and-spigot soil pipe: tar coated with cast iron fittings of corresponding weight. Service weight, ASTM Specification A 74.
- D. Cast iron soil pipe: cast iron no-hub pipe and fittings, CISPI Standard 301, ASTM A888 shall be used only above slab on grade.
- E. Ductile iron pipe: Class 52, ASTM A746, ANSI/AWWA C151/A21.51 cement lined, fittings of corresponding weight, but not cement lined.
- F. DWV copper pipe: copper drainage tube DWV meeting ASTM B 306 with cast bronze solder joint drainage fittings, ANSI B-16-23.
- G. PVC-DWV plastic pipe: PVC-DWV, ASTM D-2665 shall not be used in ceiling plenum return. Solid core only permitted. Cell core not allowed. Provide PVC to cast iron adaptors below slab on grade for caulking or compression joint. No hub bands are not allowed. As an alternative provide coupling equal to Mission Heavyweight at the finish floor.
- H. Joints for cast iron piping: compression gasket especially made for cast iron soil pipe, ASTM FC-564-85.

- I. Joints for no-hub cast iron piping: no-hub neoprene gasket and stainless steel coupling CISPI Standard 310 & ASTM C1277. Joints for 4" and larger shall be 4-band heavy-weight equal to Husky. No hub bands are not allowed below slab on grade.
- J. Joints in ductile iron pipe: push on joints applied as directed by manufacturer meeting ANSI/AWWA C111/A21.11 requirements.
- K. Joints for PVC-DWV plastic pipe: solvent welded cement, ASTM D-2564, made in accord with ASTM D-2855. Provide cast iron to PVC adaptors, for caulking or compression joint when connecting to a cast iron drain or when converting from cast iron to PVC.
- L. Install vent stacks through roof. Terminate 6" above finish roof or according to local code. Flashing is specified under Roofing Section.

2.2 DOMESTIC WATER PIPING:

- A. Domestic Water piping within building: copper tube. Water piping outside building; smaller than 3": copper tube.
- B. Copper tube, ASTM B-88, copper water tube, type "L" hard temper inside building, type "K" outside building. Fittings: wrought copper water tube fittings, ANSI B 16.18 or B 16.22. For pipe 4" and larger: Victaulic copper fittings may be substituted for soldered joints.
- C. Joints on copper tube: soldered as recommended by manufacturer, using 95-5 solder. Lead free solder, flux, etc. is required. Mechanically formed tee fitting, as created by T-Drill, is an acceptable method of installation. All joints created in this manner shall be brazed in compliance with code and in accordance with manufacturer's recommendation. Soft solder joints are prohibited. Installation shall be performed by certified T-Drill crafts people.
- D. Provide temporary construction water at site as required.

2.3 PLUMBING VALVES:

- A. Supply water piping valves as specified. All valves shall meet the Reduction of Lead in Drinking Water Act.
 - Ball valves: (2" and smaller) all bronze, 600 psig WOG, 150 psig WSP, stainless ball and stem, full port, Teflon seats, stem packing seal and thrust washer. Nibco T585-66-LF or S-585-66-LF, Watts, Apollo, Milwaukee or Josam. Provide extension stem capable of clearing 2" insulation, with memory stop, when operated will not disturb vapor seal of insulation.
 - 2. Butterfly Valves 2-1/2" and larger: Butterfly shall have a ductile iron body with EPDM seal and aluminum bronze disc. The butterfly valve shall meet MSS SP-67, type I standard. The butterfly valve shall have a CWP rating of 1380 kPa (200 psig). The valve design shall be lug type suitable for bidirectional dead-end service at rated pressure with downstream flange removed. The body material shall meet ASTM A 536, ductile iron. Nibco LD2000 or equal by Watts or Bray.
 - 3. Check valves 2" and smaller: All bronze, 125 psig WSP, swing check, Nibco S-413-Y-LF, Milwaukee or Watts.

- 4. Water pressure reducing valves: For low flow Watts LFU5B; higher capacity Watts Series LF115, or Wilkins, Conbraco or Cash Acme, complete with inlet strainer, unions and inlet and outlet pressure gauges.
- 5. Calibrated balancing valves ("Circuit Setter"): 125 psig WP, 2" and smaller bronze, screwed; 2-1/2" and larger IBBM, flanged plug valves. All with indicator for angular position of valve, meter connections with positive shut-off valves and internal seals to prevent leakage around stem. Valves should have a locking device to prevent opening past preset position. For each valve provide a flow vs. differential pressure vs. angular position calibration chart and pre-formed foam insulation suitable for temperatures from 35 to 250F. Nibco 1810LF (small) or 737 (large), Armstrong, B&G, Taco or equal.

2.4 **PIPE HANGERS**:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.
- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Pipe hangers for piping 4" and larger: adjustable wrought clevis hangers.
- E. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- F. Provide riser clamps on pipe risers on each floor. Clamps in contact with copper or plastic pipe, plastic coated.
- G. Beam Clamps: Anvil Fig. 228.
- H. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Anvil Fig. 282.
- I. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors are not acceptable).
- J. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8", 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.
- K. Support plumbing water piping within stud partitions with brackets as manufactured by P&M Bracket Company, Sumner Products, B-Line Ruff-in or Holdrite. Wire is expressly prohibited. Support horizontal plumbing soil and waste piping within stud partitions with Unistrut anchored to floor. Provide fire treated wood backing where required to anchor fixtures and brass securely.

- L. Space pipe hangers at maximum: 5' intervals for cast iron pipe. Pipe hanger spacing for screwed, solder joint and welded piping: 1/2" and 3/4", 6 ft.; 1" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3" and over, 12 ft. Install additional hangers at change of direction and valve clusters.
- M. Install pipe hangers on insulated pipe over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" or Tru-Balance insulated saddles at hangers. Provide shield insulation of rigid calcium silicate indoors or rigid Perlite Silicate outdoors, the same thickness as adjacent pipe covering. (At Contractor's option, pipe shields may be field fabricated using rigid calcium silicate or foamglass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".)

2.5 THERMOMETERS AND GAUGES:

- A. Non-mercury in glass blue reading separable socket industrial thermometers with die cast aluminum or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Trerice or Weksler. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or stems long enough to permit unions to clear insulation whichever is greater.
- B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.
- C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.
- D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourdon tubes, 316 stainless steel movement, aluminum or polypropylene solid front cases, adjustable micrometer pointer and accuracy Grade 2A not less than 1/2% of full scale over the entire range, without mounting flange. Gauges shall be Ashcroft 1279, Marsh Series P01, Trerice 450-B, Weksler AA44-2 or U.S. Gauge 1980L with minimum bourdon tube diameter of 3". Provide ball valves for all pressure gauges. Provide siphons for steam gauges.
- E. Where shown, provide temperature and pressure measurement plugs and caps equal to Peterson Equipment Co., Inc. "Pete's plug with Nordel seats and seals". Provide one Pressure and Temperature Kit consisting of a 0-100 psi pressure gauge with adaptors, and two thermometers (25-125°F and 0-220°F), all in carrying cases. Provide nipples for Pete's plugs as required to extend through pipe insulation.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION:

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Slope Sanitary Drain Lines:
 - 1. Grease lines: minimum 1/4" per 1'.
 - 2. 3" and larger: minimum 1/8" per 1'.

- 3. Less than 3": minimum 1/4" per 1'.
- C. Install piping to allow for expansion. Make connections to plumbing fixtures and all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid springing of pipes during assembly.
- D. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- E. Make horizontal water line size reductions using eccentric reducers (tops flat).
- F. Install 3/4" ball valve drains with hose adaptors at low points of water piping and at bases of all risers (where shown provide larger drains). Provide screwed caps with chains on hose adaptors.
- G. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide unions on all sides of control valves.
- H. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulating unions or couplings, equal to Victaulic style 47, "V-line" insulating couplings as manufactured by Lochinvar, thread to thread or CTS fabrication flange adaptors for flange connections.
- I. Near heating and air conditioning equipment requiring water provide valved and capped water outlets of sizes shown for connection to equipment, including reduced pressure principal backflow preventers. Make final connections under HVAC work. *Note that all piping and insulation downstream from backflow preventer must be painted yellow.*
- J. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- K. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- L. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.
- M. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.
- N. Provide water hammer arrestors equal to Wilkins WH2950XL. Refer to drawings for location and P.D.I. size. Shock arrestors are required on all equipment with solenoid shutoff valves such as washing machines and dishwashers whether shown or not. Select WH2950XL for use with fixtures which may supply drinking water. Equal by Josam, J.R. Smith, Wade, or Sioux Chief is acceptable.
- O. All water piping shall be installed within the heated envelope of the building, or otherwise protected from freezing.

3.2 INSTALLATION OF VALVES:

A. Provide shut-off valves in supply and return connections to each item of equipment. Locate valves to isolate each item to facilitate maintenance and/or removal.
- B. Provide check valve in discharge line adjacent to each pump.
- C. Locate valves in piping connections to heat exchangers, water heaters, etc., so heads and tube bundles can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to the equipment.
- D. Provide sweat to screw adaptors where required.
- E. Install with valve stems upright or horizontal.

END OF SECTION

SECTION 22 15 00

THERMAL AND ACOUSTICAL INSULATION FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.0 GENERAL:

A. All insulation shall be installed by an insulation contractor in business a minimum of 3 years as an insulation contractor and has completed projects similar in scope to this project.

1.1 SCOPE:

- A. Section 22 05 00 "General Provisions Plumbing" shall apply to and become part of this Section.
- B. Repair existing insulation at points of connection and/or alterations to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. (Items which are not "exposed" are considered "concealed".)
- D. The use of any material containing asbestos is strictly prohibited.
- E. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

1.2 INSULATION:

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 22 10 00 "Materials and Methods Plumbing."
- C. Use insulation and adhesives with Underwriter's Laboratories and ASTM E-84 flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:
 - 1. 50 for pipe covering located in air ducts, plenum or casings.
 - 2. 150 for all other pipe and equipment insulation.

PART 2 - MATERIALS

2.1 FIBERGLASS PIPE COVERING:

- A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr)(sq. ft.)(°F/in) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ). For domestic hot water circulating system, thermal conductivity shall be 0.27 BTU/(h)(sq.ft.)(°F/in.) at 75°F mean temperature.
- B. For all lines seal jacket with self sealing lap. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.
- C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies and flanged unions. Do not cover screwed unions on hot lines. Finish concealed fittings with a skim-coat of mastic and when mastic is dry, fitting shall be covered with glass fab and vinyl acrylic mastic unless otherwise noted below. Zeston type fitting covers may be substituted for glass fab and final coat of mastic on concealed fittings provided fire and smoke ratings are met. Finish fittings exposed in equipment rooms, boiler room, and in finished spaces with vinyl acrylic mastic over glass fab over mastic.
- D. At contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab over skim coat of mastic shall be applied around main, lapping contoured joint at branch by 2" minimum for the full 360° of joint. Cover entire fitting covering with vinyl-acrylic mastic over glass fab, 1/8" thick (dry) coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

2.2 FOAMED PLASTIC PIPE COVERING: (DO NOT USE IN PLENUMS UNLESS COMPLIES WITH PARAGRAPH 1.2 ABOVE):

- A. Fire retardant foamed plastic pipe covering, maximum K factor at 75°F mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in).
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction.
- E. Fit pipe hangers over insulation (see PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Where exposed outside, cover insulation with aluminum jacket.
- G. Armacell, Aeroflex or Normaco.

PART 3 - INSTALLATION

3.1 PLUMBING PIPING:

- A. Bodies of floor drains and floor sinks serving refrigeration equipment, AC units and ice machines and traps and waste piping between such drains and waste stack: "Foamed plastic pipe covering", 1" thick.
- B. Cold water piping, interior, above grade: "Fiberglass pipe covering", 1" thick. Pipe insulation in partitions and chases may be 1/2" thick when needed for tight spaces.
- C. Hot water piping, interior, above grade: "Fiberglass pipe covering", 1" thick. Pipe insulation in partitions and chases may be 1/2" thick when needed for tight spaces. All piping in recirculating system shall have 1" thick insulation for up to 1-1/4" pipe, and 1-1/2" thick insulation for 1-1/2" and larger pipe.

END OF SECTION

SECTION 22 20 00

PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE:

A. Section 22 05 00 - "General Provisions - Plumbing" and Section 22 10 00 - "Materials and Methods - Plumbing" shall apply to and become part of this Section.

PART 2 - PRODUCTS

2.1 DRAINS:

- A. Mechanical Room Floor Drains (MFD): J.R. Smith 2330 with sediment bucket, deep seal trap, and trap primer connection where shown or required.
- B. Floor drain (FD): J.R. Smith 2005A with 6" nickel bronze grate. Select square top for tile floors. Provide primer connection where shown. Provide Trap Guard trap protectors where not shown. Provide deep seal trap on all floor drains.
- C. Floor Sink (FS): J.R. Smith 3400-10, 12" diameter, 8" deep porcelain enameled cast iron interior, less top grate, with porcelain enameled dome bottom strainer.

2.2 TRAP PRIMER:

A. Electronic Trap Primer (ETP): Precision Plumbing Products Model PT electronic with access door where multiple drains are served.

2.3 WALL HYDRANT:

A. J.R. Smith 5509-QT or Prier C-634, with integral backflow preventer, latching cover, freeze-proof and of proper length for wall in which installed, verify with Architect finish of stainless steel, polished bronze, nickel bronze or rough bronze box face. Valve must be on building side of exterior wall insulation. Install with center line 24" above finish grade. Provide Owner with one loose key for each wall hydrant. For existing or pre-cast exterior walls use J.R. Smith 5609-QT.

2.4 HOSE BIBB:

A. T&S B-0736-P0L, chrome-plated with removable tee handle in finished areas, and Model No. B-0736-RGH rough bronze in unfinished areas complete with vacuum breaker. Provide to Owner one loose key for each loose key hose bibb.

2.5 CLEANOUTS:

- A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angles, upper terminals and not over 50' apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk rectangular tapered slotted plugs. PVC piping cleanouts shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall be full size of pipe, 8" and less.
- B. Exposed Cleanouts: Cast brass plug type, J.R. Smith 4470T.
- C. Wall type cleanout plug and access covers, J.R. Smith 4472T. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic and acid waste pipe in wall: Cleanout access cover J.R. Smith <u>4710</u>.
- D. Floor type cleanout access covers in unfinished areas: J.R. Smith 4239L/LXH-NB. Finished areas: J.R. Smith 4111L/LXH-NB. Plug must be within 3" of finished floor. Provide 4193L/LXH-NB covers where installed in terrazzo floors. Grout cleanout below access cover to seal watertight. Provide option 14 cleanout carpet markers where installed in carpeted floors.

E. Coordinate the exact location of all cleanouts with the Architect.

2.6 PLUMBING FIXTURES:

- A. Unless otherwise specified, all fixtures complete as catalogued, white color, exposed metal trim chromium plated. Fixtures shall be without discoloration, chips or flaws and shall be free from cracks. Warped or otherwise imperfect fixtures will not be acceptable.
- B. Clean all fixtures to a clean and sanitary condition.
- C. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lag bolts, as recommended by the manufacturer.
- D. Flush valve supports equal to Sloan "YJ" shall be installed 1" below vacuum breaker, on all flush valves. Flush valves on A.D.A. water closets must be set so that handle is to the wide side of the stall and handle is no more than 44" above finish floor. Urinal flush valves on A.D.A. urinals shall be no more than 44" above finish floor.
- E. Seal wall hung fixtures at wall with white caulk. Seal countertop fixtures with clear silicone sealant. Seal floor mounted fixtures at floor with grout.
- F. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall. Elevation of flush valves shall be coordinated with grab bars (see Architect).
- G. All supplies, stops, faucets, etc. on fixtures that could be used for drinking water shall meet the Reduction of Lead in Drinking Water Act.
- H. Contractor shall coordinate all sinks and faucets with casework/millwork shop drawings prior to purchase of sink/faucet. In particular, coordinate A.D.A. vs. non-A.D.A. fixtures with casework/millwork. Failure to do so will make contractor liable for incorrect fixtures.

I. All items complete as catalogued as follows:

WC-1 Water Closet: Kohler K-96053: Sloan G2 111 HW-1.6-LT hard-wired sensor flush valve. Include transformer for up to 6 valves. Complete with "YJ" pipe support and Church 295 NSSC white open front seat.

WC-2 Water Closet: Kohler K-96057, 16-1/2" floor to rim, to meet A.D.A.: Sloan G2 111 HW-1.6-LT hard-wired sensor flush valve. Include transformer for up to 6 valves. Complete with "YJ" pipe support and Church 295 NSSC white open front seat. Install flush valve with handle on wide side of stall or room. Must meet A.D.A.

UR-1 Urinal: Kohler K-5016-ET: Sloan ECOS 186 HW hard-wired sensor flush valve with "YJ" pipe support. Include transformer for up to 6 valves. Set with lip 17" A.F.F. and flush valve handle no more than 44" A.F.F. Must meet A.D.A.

UR-2 Urinal: Kohler K-5016-ET: Sloan ECOS 186 HW hard-wired sensor flush valve with "YJ" pipe support. Include transformer for up to 6 valves. Set with lip 17" A.F.F. and flush valve handle no more than 44" A.F.F. Must meet A.D.A. Mount at ADA height.

LAV-1 Lavatory: (2 bowls) Bradley ELX-2 Express Lavatory System seamless, one-piece, solid surface construction, support bracket, access panel, includes strainer and drain assembly, mount at height as shown on Arch. drawings. Select Crestt Series plug in sensor faucet, 0.5 gpm. Include ASSE 1070 thermostatic mixing valve. No soap dispenser. Finish by Architect. Equal by prior approval only.

LAV-2 Lavatory: (3 bowls) Bradley ELX-3 Express Lavatory System seamless, one-piece, solid surface construction, support bracket, access panel, includes strainer and drain assembly, mount at height as shown on Arch. drawings. Select Crestt Series plug in sensor faucet, 0.5 gpm. Include ASSE 1070 thermostatic mixing valve. No soap dispenser. Finish by Architect. Equal by prior approval only.

MS-1 Mop Sink: Stern Williams MTB-2424, 24" x 24" x 10" deep pre-cast terrazzo with aluminum guards on exposed sides and silicone sealant at walls. Provide splash catcher panels on adjacent walls. Provide T&S B-667-RGH faucet with spring checks. Set 42" above finish floor complete with heavy-duty hose.

SK-1 Hand Sink: Advance Tabco 7-PS-60, 10" x 14" x 5" D wall mounted, stainless steel, with gooseneck faucet.

SK-2 Three Compartment Sink: Advance Tabco 93-3-54-18L, 16 gauge, 16" x 20" x 14" deep, 18" left drainboard, front and side cross braces. T&S Brass B-2463 double pantry splash mount faucet, 8" centers, 12" swing nozzle, 4" wrist handles. Include McGuire drains and tailpieces, LF-165 supplies and stops.

EWC-1 Electric Water Cooler: Elkay LZSTL8WSSK bi-level water cooler with bottle filler and filter. All stainless steel, J.R. Smith Carrier, McGuire LF165 supply with stop and 8872 P-trap.

2.7 PLUMBING EQUIPMENT:

A. **TMV Thermostatic Mixing Valve:** Lawler Series 801, set to 120°F. Minimum flow 1 gpm, up to 25 gpm at 10 psi drop.

B. EWH-1 Electric Water Heater: A.O. Smith DEN, tank type. Install per detail.

2.8 EQUIVALENT MANUFACTURERS:

- A. Where Kohler fixtures are listed above, Zurn, American Standard, or Toto may be utilized.
- B. Where Sloan flush valves are listed above, Zurn or Delaney may be utilized.
- C. Where Smith is listed above, Josam, Watts, Zurn or Wade may be utilized.
- D. Where Elkay water coolers are mentioned above, Halsey Taylor, Sunroc, or Oasis may be utilized.
- E. Where B&G is listed above, the equal of Armstrong, Taco, or Thrush may be utilized.
- F. Where Advance Tabco sinks are listed above, Zurn or Elkay may be utilized.
- G. Where Church water closet seats are listed above, Zurn, Beneke, Bemis, Centoco or Olsonite may be utilized.
- H. Where Lawler combination pressure balanced and thermostatic mixing valves are listed above, Powers, Symmons, or Leonard may be utilized.
- I. Where T&S Brass is listed above, Chicago Brass, Cambridge or Zurn may be utilized.
- J. Where A.O. Smith water heaters are listed above, Lochinvar, Rheem, State or Bradford White may be utilized.
- K. Where Stern Williams is listed above, Fiat, or Zurn may be utilized.
- L. Where McGuire is listed above, the equal of Zurn, Watts, Dearborn or Brasscraft may be utilized.

PART 3 - EXECUTION:

3.1 MANUFACTURER'S INSTRUCTIONS:

A. Install all plumbing equipment and fixtures as recommended by the manufacturer's recommendations.

END OF SECTION

DIVISION 23 – HVAC

23 05 00 – GENERAL PROVISIONS – HVAC 23 10 00 – MATERIALS AND METHODS – HVAC 23 15 00 – THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS 23 50 00 – HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES 23 60 00 – AIR DISTRIBUTION 23 70 00 – HVAC TESTING AND BALANCING 23 80 00 – CONVENTIONAL AUTOMATIC CONTROLS 23 81 00 – BUILDING AUTOMATION SYSTEM (BAS)



02-08-2024

SECTION 23 05 00

GENERAL PROVISIONS – HVAC

PART 1 – GENERAL

1.1 SCOPE:

- A. Provisions of this Section apply to all Heating, Ventilating, and Air Conditioning (HVAC), Controls, and Test and Balance work.
- B. Include the provisions of General Conditions as part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, complete and ready for operation, consisting in general of the following:
 - 1. AHU-1, AHU-2, ERU-1, DOAS-1, CU-1, HP-1/AC-1A & AC-1B, HP-2/AC-2, HP-3/AC-3, HP-4/AC-4, HP-5/AC-5, HP-6/AC-6, HP-7/AC-7, HP-8/AC-8, HP-9/AC-9, HP-10/AC-10, HP-11/AC-11, CU-ELEC/AC-ELEC, EF-1, EF-2, EF-3, EF-4, EF-5, EWH-1, ductwork, fittings, etc., refrigerant piping, fittings, etc.
- D. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.

1.2 USE OF BUILDING SYSTEMS FOR TEMPORARY HEAT/AIR CONDITIONING DURING CONSTRUCTION:

- A. Building HVAC systems <u>shall not</u> be used during construction unless the following conditions are met: (Existing systems may be used during construction and the following must be met:)
 - 1. All return air and outside air openings shall have temporary filter media installed over inlet side of openings and secured air tight there-to.
 - 2. Air filters of quality specified for ultimate use shall be installed in the air handling units.
 - 3. Motors shall have correct overload elements installed in the starters.
 - 4. All safety controls shall be in operation.
- B. Contractor shall turn system over to Owner in condition equal to that which would have occurred if the systems had not been used during construction.

1.3 DRAWINGS:

- A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings and conditions existing in the field. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work.
- B. Follow the drawings closely, coordinate dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or miss-located work in proper manner.
- D. DO NOT scale drawings to locate ceiling diffusers. COORDINATE with lighting and ceiling grids. Contractor for HVAC work is responsible for coordinating with all trades.
- E. Drawings and specifications are complementary. Work shown or specified in one is binding as if shown or specified in both. Any discrepancies between the drawings and specifications shall be brought to the attention of the Consultant for clarification during the bidding period. No allowance shall be subsequently made to the Contractor by reason of his failure to have brought said discrepancies to the attention of the Consultant during the bidding period or by reason of any error on the Contractor's part.
- F. No attempt has been made to establish the required sections or splits of equipment relative to the size of access into the space, building, etc. Contractor shall establish all said splits, sections, etc. necessary to install equipment complete without undue disassembly of equipment or demolition of building parts at site of work.

1.4 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/B31.9 Code for Building Services Piping
 - 2. ANSI/ASHRAE 15 Safety Code for Mechanical Refrigeration
 - 3. ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality
 - 4. ASHRAE 90.1 Energy Compliance
 - 5. NFPA Table 12-3.2.1, Hazardous Area Protection
 - 6. NFPA 30 Flammable and Combustible Liquids Code
 - 7. NFPA 31 Installation of Oil-Burning Equipment
 - 8. NFPA 70 National Electrical Code
 - 9. NFPA 90A Installation of Air Conditioning and Ventilating Systems

- 10. NFPA 101 Safety to Life from Fire in Buildings and Structures
- 11. Other standards as referenced in other sections of Division 23
- 12. 2009 International Building Code
- 13. 2009 International Plumbing Code
- 14. 2009 International Fuel Gas Code
- 15. 2009 International Mechanical Code
- 16. 2009 International Energy Conservation Code

1.5 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The HVAC Subcontractor shall meet the following qualifications:
 - 1. He shall have been in business as a HVAC contractor for at least 3 years prior to the date of opening bids, and shall have held a license from the **Alabama** State Licensing Board for General Contractors for at least 3 years.
 - 2. He shall be, or have had in his employ continuously for at least 3 years, a professional engineer registered in the State of **Alabama**, who is actively connected with the air conditioning department of Subcontractor's company and thoroughly experienced in such work.
 - 3. He shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project, and for at least 3 years prior to the date of opening bids shall have had an established service department capable of providing service inspection or full maintenance contracts.
 - 4. If the HVAC subcontractor, with the Engineer's approval, uses a sub-subcontractor to provide another discipline that the subcontractor does not normally furnish, that sub-subcontractor shall meet the same qualifications as the subcontractor.

1.6 CONFLICTS AND INTERFERENCES:

A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.7 WORKMANSHIP:

A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.8 COOPERATION:

A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.9 VISITING SITE:

A. Visit site and become familiar with location and various conditions affecting work prior to bid. No additional allowance will be granted because of lack of knowledge of such conditions. No consideration shall be given to future claims due to existing conditions. Any discrepancies or interferences shall be reported immediately to the Architect/Consultant.

1.10 MATERIALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. **Unless otherwise noted**, **all pipe**, **fittings and valves shall be made in the United States of America**.
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the estimate, without substitution, and shall be furnished under the contract unless requests for equivalents are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Equivalents will be considered only if written request for approval has been received by the Architect (from a general contract bidder) 10 days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which an equivalent is proposed and a complete description of the proposed equivalent including drawings, cuts, performance and test data, and deviation from the specification and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the equivalent may require shall be included. The burden of proof of the merit of the proposed equivalent is upon the proposer. The Architect's decision of approval or disapproval of a proposed equivalent is final.
- D. If the Architect approves any proposed equivalent prior to receipt of Proposals, approval will be set forth in an Addendum. **DO NOT RELY UPON APPROVALS MADE IN ANY OTHER MANNER.**
- E. No proposed equivalent will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Within 45 days of execution of contract and before ordering materials or equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Submit PDF format files for approval. Provide PDF files of approved data for project close-out.
- G. Similar items of equipment shall be the product of the same manufacturer.

1.11 SHOP DRAWINGS:

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn to 1/4" to 1'-0" scale.
 - Ductwork (do not scale for diffuser locations, but coordinate with ceiling grids and lighting layout). See Section "Air Distribution". Shop drawings shall include material type (stainless steel, galvanized), finish (paint grip, etc.), actual sizes increased to allow for internal insulation and gauges along with fabrication section notes for individual sections. In addition, include elevations of bottom of duct above finished floor level. Show building sections through congested areas for coordination with structure and other disciplines. Provide joint details, duct seal methods, insulation type, etc.
 - 2. Complete mechanical equipment and fan room plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
 - 3. Equipment piping.
- B. Submit complete control and power wiring diagrams for approval before installing controls. See Controls Section.
- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.

1.12 COORDINATION SHOP DRAWINGS:

- A. Coordination shop drawings (2 sets of bond and PDF digital format files) will be drawn to a scale not smaller than 1/4" = 1'-0".
- B. Start drawings as HVAC shop drawings indicating all ductwork piping, equipment and locations of mechanical room floor drains, and electrical connections to motors. Indicate elevations of all ductwork and piping. Draw sections as required to clarify congested situations.
- C. Engineers' CAD/electronic drawings files will be available upon request for the convenience of the contractor and for use in preparation of shop drawings. A service fee of \$100.00 per drawing sheet file shall be remitted to the Engineer prior to delivery of CAD/electronic drawing files along with a signed agreement between the Engineer and Contractor.
- D. Next, the Plumbing Contractor shall add all piping and plumbing to the drawings.
- E. Next, the Fire Protection Contractor shall add all sprinkler heads and fire protection piping.
- F. Next, the Electrical Contractor shall add all electrical fixtures, conduit and equipment.
- G. Next, the drawings shall be submitted to the General Contractor for final coordination.
- H. Finally, after the General Contractor has approved the drawings they shall be submitted to the Architect for his review and comments.

1.13 RECORD DRAWINGS:

- A. When work starts the Architect will furnish two complete sets of white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this contract.
 - 1. Accurately show location, size and elevation of new exterior utility work and its relationship to any existing utilities, obstructions, etc., contiguous to the area of work.
 - 2. Block out areas modified by change-order & identify them by change-order number.
 - 3. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- C. When work is completed, the Engineers' CAD/electronic drawing files will be made available upon request for the convenience to the contractor for a service fee of \$100.00 per CAD/electronic drawing sheet file and for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the CAD files, removing all superseded data in order to show the actual completed conditions.
- D. Ductwork and Control Drawings may be CAD files or a set of mylar reproducible shop drawings, up-dated to show actual conditions at completion of work. Include the contract drawings equipment schedules and details edited to show actual completed conditions.
- E. HVAC piping drawings may be prepared as noted above, or HVAC piping may be added to the ductwork shop drawings noted above.

1.14 **PROTECTION OF ROTATING PARTS**:

- A. For this paragraph only, "exposed" shall mean located in a casing or room or plenum with door large enough to admit a man.
- B. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.
- C. Equip propeller fan wheels with wheel guards.
- D. Equip inlets and outlets of exposed centrifugal fans with 1-1/2" #10 Diamond mesh galvanized steel screens.
- E. Equip all exposed plug fans with wheel screens.

1.15 **PROTECTION OF EQUIPMENT:**

- A. During construction, protect mechanical equipment from damage or deterioration.
- B. When installation is complete, clean equipment and make ready for painting.

1.16 INSTALLATION OF EQUIPMENT:

- A. Install equipment to provide normal service access to all components.
- B. Where drawings show sufficient space for removing components, install equipment to provide such clearance. Provide space at all equipment power and control panels as required by local codes.
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.
 - 2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 3. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.
 - 4. Air devices connected by flexible duct shall be secured independently of all other building systems to prevent falling if grid shifts.

1.17 EQUIPMENT SUPPORTS:

- Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors. Prime coat and paint all grillage, supports, etc. located indoors. Where noted provide 304 stainless steel supports. At the Contractor's option, all grillage, supports, etc. located outdoors may be 304 stainless steel instead of hot dip galvanized.
- B. Set floor-mounted equipment on concrete pads or platforms (as indicated) of height shown, but not less than 3-1/2" high. Chamfer pads 1". Provide pads as follows:
 - 1. DOAS-1.
- C. Provide factory fabricated equipment roof supports with tops 16" above roof line for roof mounted items as noted. Supports shall have integral cants, pressure treated wood nailers, and counter flashing. Supports shall be galvanized steel, gauge as required for loads, 18 gauge minimum.

1.18 CUTTING AND PATCHING AND INCIDENTAL WORK:

- A. Set sleeves and inserts and lay out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Provide all motors incidental to the HVAC systems. Wiring of motors, switches and starters is included in "Electrical Sections".

- D. Do all control wiring required for HVAC work and all power wiring required by Control Panels, Control System, and Control Devices.
- E. Furnish motor starters as specified below.
- F. Final water connections to services are included in this Section.
- G. Permanent drain connections from AC units, etc., and auto air vents to nearest floor drain are included in this Section.
- H. Door louvers are not included in this Section.

1.19 FLASHING:

- A. General: Furnish all fan curbs, pitch cups, metal base flashing and counter flashing required for HVAC Work. Installation of above items is specified in Roofing Section.
- B. Fan curbs for power roof ventilators are specified with the fans.
- C. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel duct items. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- E. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

1.20 EXCAVATION & BACKFILLING:

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. (Do not use piers to support piping.)
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel (89/10) in accordance with requirements of "Sitework" no less than 95% compactancy. Backfill paved areas with sand or fine gravel (89/10) compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.
- D. Resod grassed areas and replace bushes, etc.

1.21 MOTORS, STARTERS & ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from that shown on the Electrical Drawings, the Contractor shall be responsible for the cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.
- D. Motors: 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower motors shall meet NEMA premium efficiency levels as stated in the latest version of NEMA MG-1. Allis-Chalmers, General Electric, Goulds, Louis Allis, Westinghouse.
- E. Where motors are shown or scheduled to be connected to a variable frequency drive, this motor shall be an inverter duty rated by the motor manufacturer and shall comply with NEMA MG1, Article 31.
- F. Where shown on Electrical Drawings, furnish increment wound motors for 2-step starting.
- G. Where shown on electrical drawings, furnish 2 speed separate winding motors 1800/900 rpm.
- H. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.
- I. Furnishing all starters is included in this Section. Starter installation is specified under "Electrical Section". Starters shall be equipped with melting alloy thermal overload and phase loss protection, in all 3 phases.
- J. All starters, except those noted below, are specified in "Electrical Section".
- K. Starters for the following items are specified with the equipment:
 - 1. AHU-1, AHU-2, DOAS-1, CU-1, ERU-1, HP-1/AC-1A & AC-1B, HP-2/AC-2, HP-3/AC-3, HP-4/AC-4, HP-5/AC-5, HP-6/AC-6, HP-7/AC-7, HP-8/AC-8, HP-9/AC-9, HP-10/AC-10, HP-11/AC-11, CU-ELEC/AC-ELEC, EF-1, EF-2, EF-3, EF-4, EF-5 & EWH-1.
- L. Unless otherwise shown or specified for single phase motors provide manual starters equal to Square D Class 2510. When installed in equipment rooms provide surface mounted enclosure, and when installed in finished walls outside equipment rooms provide flush mounted enclosure, key operated.
- M. All starters shall be the product of the same manufacturer.
- N. All control panels, electrical assemblies, etc. must bear a label from a recognized testing laboratory as an assembly, not as individual components.

1.22 SLEEVES:

A. For pipe through floors inside fire rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1" larger than pipe or pipe covering.

- B. For pipe through concrete beams: schedule 40 black steel pipe, 1" larger than pipe or pipe covering.
- C. For pipe passing through floors outside fire rated chases and fire rated walls and partitions, provide 20 gauge steel sleeve leaving the annular space between pipe or pipe covering as required by UL systems. Where pipe is insulated, insulation shall be continuous thru sleeve. Refer to Through-Penetration Firestop Systems where included in the contract documents. Otherwise, seal between sleeve and pipe or pipe covering with 3M Brand Fire Barrier CP 25WB caulk, Flamestop V, Specified Technologies, Inc. "Spec Seal Sealant", Rectorseal Corp. Metacaulk 950 or Hilti FSONE bearing UL listing for actual conditions of installation, thickness and application in strict accord with UL reference for each type installation. Any equivalents must meet the 10 day prior approval provision and must show UL approval for each application and if caulk comes in direct contact with pipe, it must be compatible and not injurious to the pipe.
- D. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.
- E. Sleeves for ducts: see fire dampers (Section: Air Distribution).
- F. Extend floor sleeves 1-1/2" above finish floor in areas where floor is subject to being wet during normal usage (mechanical rooms, toilets, etc.).
- G. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Fit closure plates snugly to duct and secure to wall. Grout around ducts and sound absorbers at equipment room walls.
- H. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

1.23 PAINTING:

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Paint un-insulated duct surfaces visible through grilles and registers flat black.
- D. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section.
- E. Prime and paint all grillage, supports, etc. located indoors except where noted to be galvanized.
- F. Other painting is specified in Painting Section, Finishes Division.

1.24 PIPE IDENTIFICATION:

A. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.

1.25 EQUIPMENT IDENTIFICATION:

- A. Provide 2" x 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under Division 23.
- C. Secure nameplates with acorn head screws.

1.26 EXHAUST FAN IDENTIFICATION:

A. 2" X 3" or larger laminated plastic nameplates with red letters and numbers on white background, identifying type of fan, number according to plans, and rooms served. Engrave on upper half of tag, leaving lower half for engraving by Owner. Fasten with acorn head screws.

1.27 ACCESS DOORS:

- A. Furnish and install access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-liftout ceilings or behind partitions or walls. Doors in non-fire rated walls and ceilings: 16-gauge steel with hinges and screwdriver latches. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Doors in security ceilings to be 10 ga. steel panels, white powder coat, 2" x 2" x 3/16" steel angle frame heavy duty butt hinges with security screws. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance. Doors: Bar-Co, Nystrom, Williams Bros., or equal.
- B. Mark lay-in ceilings with colored vinyl self adhering disc stuck on grid adjacent to maintenance access points.

1.28 TESTS, CLEANING & ADJUSTMENTS:

- A. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 72 hour notice is required prior to performance of test.
- B. After systems have been installed complete, adjust and test systems for proper operation, air distribution, temperatures, humidities and correct all noise or vibration conditions. All HVAC air balance work shall be performed by an independent test and balancing agency specializing in testing and balancing of air conditioning systems. The agency selected shall be an AABC or NEBB member and shall obtain written approval from the Architect before bidding. All instruments used for testing and balancing must have been calibrated within 6 months and checked for accuracy prior to start of work.
- C. Perform all tests as required by local codes. Contractor shall furnish testing equipment.
- D. If local codes are more stringent than the following, local codes shall govern.

- E. Refrigeration System: When system is complete, but before the pipe covering has been installed, test components with dry nitrogen and make tight at equipment manufacturer's recommended test pressures. Then evacuate the system to 26" Hg. vacuum which the system shall hold for 24 hours. After passing the above tests, charge and leak test under operating conditions using electronic leak detector.
- F. Start-Up and Service:
 - 1. The Contractor and factory authorized service representative for the variable frequency drives shall place each item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period. Adjustment services do not include lubricating fans or motors and does not include changing filters or adjusting belts.
 - 2. In addition, submit equipment manufacturers' start-up reports for items listed above. See Paragraph "Project Close-Out", below.

1.29 WARRANTY & INSTRUCTIONS:

- A. See General Conditions One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one year after date of substantial completion of the Contract. Should any defects in material, workmanship, or equipment be made known to Contractor within the one-year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. All reciprocating and scroll refrigeration compressors shall bear 5-year non-pro-rated parts warranty.
- After completion of the work, Contractor shall operate the equipment which he installs for a period of (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment.
- E. Provide PDF of manufacturer's operating and maintenance manuals and parts lists for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency thereof. Include all warranty dates on equipment and guarantees.
- F. Any work performed on new or existing air conditioning/refrigeration equipment, whether inside or out, that requires removing the refrigerant from the system will require the use of a recovery/recycling unit. Intentional release of the refrigerant, regardless of type, will not be allowed.
- G. Any refrigerant removed from a system that has been properly recycled and has not been exposed to "burn out" <u>can and should</u> be reused in the system. Refrigerant that has been contaminated and cannot be reused after being properly recycled shall be reclaimed by the contractor and returned to the proper company representative.
- H. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- I. Supply initial charges of refrigerant, refrigeration lubricating oil and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.

J. Make available to the Owner, without additional cost, warranty service and adjustment of the equipment for the guarantee period. Due to critical temperature guidelines Contractor shall respond to Owner's call for service within a 6 hour time period.

1.30 PROJECT CLOSE-OUT:

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. A letter signed by the subcontractors for HVAC, electrical, temperature control work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired and that controls and power circuits will function properly.
 - 2. Record drawings sheet metal work: PDF files and CAD files.
 - 3. Record drawings piping: PDF files and CAD files.
 - 4. Record drawings control systems: PDF files and CAD files.
 - 5. Control manufacturer's letter of certification.
 - 6. Air balance report PDF files. (See Section 23 70 00 "HVAC Testing & Balancing").
 - 7. Equipment Submittal Data PDF files.
 - 8. Equipment operating and maintenance manuals PDF files.
 - 9. Maintenance schedule.
 - 10. Equipment warranty dates and guarantees.
 - 11. List of Owner's Personnel who have received maintenance instructions.
 - 12. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

END OF SECTION

SECTION 23 10 00

MATERIALS AND METHODS – HVAC

PART 1 - GENERAL

1.1 SCOPE:

A. Section 23 05 00 - "General Provisions - HVAC" shall apply to and become part of this Section.

PART 2 - MATERIALS: (All pipe, fittings and valves shall be manufactured in the United States of America)

2.1 HVAC DRAIN PIPING:

- A. Standard weight galvanized steel pipe ASTM A106 with galvanized malleable iron fittings, or type L hard copper with wrought copper sweat fittings, at Contractor's option.
- B. Provide drain traps for AC unit drain pans. Size traps as required to drain under operating conditions. See trap detail on drawings.

2.2 **REFRIGERATION PIPING:**

- A. Type L hard drawn copper tubing with wrought copper sweat fitting joints: Stay Brite-8 silver bearing solder with continuous flow of dry nitrogen through lines.
- B. Size all lines per manufacturer's recommendations and requirements based on actual line lengths, distances, and elevations, so as to ensure oil return at minimum loading.
- C. Small lines 5/8" OD and smaller may be soft copper with flare fittings, provided that all joints are exposed for visual inspection.
- D. Refrigerant piping shall not be left open for a period longer than necessary to assemble the piping, provide nitrogen flow, and solder. In no case shall any piping assembled or stored be left open at the end of the day. Pipe that is assembled but not soldered is open. Piping that is stored shall not be used if it has lost the manufacturer's nitrogen charge.

2.3 **PIPE HANGERS**:

- A. General: Pipe hangers, Anvil, PHD, Michigan Hanger, B-Line or Elcen. Anvil figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines.
- B. Equip pipe hangers with vibration isolators as specified under Vibration Isolators.

- C. Pipe hangers for lines 3" and smaller: adjustable wrought ring hangers, Anvil Fig. 97 or 69 or wrought clevis hangers.
- D. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on but not anchor to trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.
- E. Beam Clamps: Anvil Fig. 228.
- F. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8", 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.
- G. Space pipe hangers at maximum: Pipe hanger spacing for screwed, solder joint and welded piping: 1/2" and 3/4", 6 ft.; 1" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3" and over, 12 ft. Install additional hangers at change of direction, valve clusters, and at all duct and unit mounted coils.
- H. Install pipe hangers on insulated pipe over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" or Tru-Balance insulated saddles at hangers. Provide shield insulation of rigid calcium silicate indoors or rigid Perlite Silicate outdoors, the same thickness as adjacent pipe covering.
- I. Wrap bare copper refrigerant lines with sheet lead or molded plastic sleeve at hangers.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION:

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxyacetylene welding. Provide full perimeter welds at both face end and collar end of each slip-on flange.
- C. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid springing of pipes during assembly.
- D. Pitch air conditioning unit drain lines down in direction of flow 1/8" per foot of horizontal run. Grade chilled and hot and condenser water supply and return lines down to drains and up to air vents.
- E. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.

- F. Install 3/4" ball valve drains with hose adaptors at low points of water piping and at bases of all risers where shown provide larger drains. Provide screwed caps with chains on hose adaptors.
- G. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide unions on all sides of control valves.
- H. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulating unions or couplings, equal to Victaulic style 47, "V-line" insulating couplings as manufactured by Lochinvar, thread to thread or CTS fabrication flange adaptors for flange connections.
- I. Run piping concealed, except where specifically shown or specified to be exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.
- J. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.
- K. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.
- L. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.

3.2 INSTALLATION OF VALVES:

- A. Provide shut-off valves in supply and return connections to each item of equipment. Locate valves to isolate each item to facilitate maintenance and/or removal.
- B. Locate valves in piping connections to coils, so coils can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to the equipment.
- C. Provide sweat to screw adaptors where required.
- D. Install with valve stems upright or horizontal.

END OF SECTION

SECTION 23 15 00

THERMAL AND ACOUSTICAL INSULATION FOR HVAC SYSTEMS

PART 1 - GENERAL

1.0 GENERAL:

A. All external duct insulation and flexible duct shall be legibly printed or identified at intervals not greater than 36 inches with the name of the manufacturer, the thermal resistance R-value at the specified installed thickness and the flame spread and smoke-developed indexes of the composite materials.

1.1 SCOPE:

- A. Section 23 05 00 "General Provisions HVAC" shall apply to and become part of this Section.
- B. Repair existing insulation at points of connection and/or alterations to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. Items which are not "exposed" are considered "concealed".
- D. The use of any material containing asbestos is strictly prohibited.
- E. Include with insulation material submittal letters from the insulation material manufacturer certifying that the insulation material does not contain asbestos in any shape, form or quantity.

1.2 INSULATION:

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 23 10 00 "Materials and Methods HVAC."
- C. Use insulation and adhesives with Underwriter's Laboratories and ASTM E-84 flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:
 - 1. 50 for pipe covering located in air ducts, plenum or casings.
 - 2. 150 for all other pipe, duct and equipment insulation.

PART 2 - MATERIALS

2.1 FIBERGLASS PIPE COVERING:

- A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr)(sq. ft.)(°F/in) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ).
- B. For all lines seal jacket with self sealing lap. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.
- C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies and flanged unions. Do not cover screwed unions on hot lines. Finish concealed fittings with a skim-coat of mastic and when mastic is dry, fitting shall be covered with glass fab and vinyl acrylic mastic unless otherwise noted below. Zeston type fitting covers may be substituted for glass fab and final coat of mastic on concealed fittings provided fire and smoke ratings are met. Finish fittings exposed in equipment rooms, boiler room, and in finished spaces with vinyl acrylic mastic over glass fab over mastic.
- D. At contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab over skim coat of mastic shall be applied around main, lapping contoured joint at branch by 2" minimum for the full 360° of joint. Cover entire fitting covering with vinyl-acrylic mastic over glass fab, 1/8" thick dry coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

2.2 ALUMINUM JACKET (PIPING):

- A. 0.016" thick smooth aluminum jacket with laminated polyethylene and kraft paper adhered liner.
- B. Roll jacket slightly smaller than insulation diameter and secure in place with flat aluminum bands 12" o.c. Lap jacket minimum 2" and place overlap at \pm 120° arranged to shed water.
- C. Finish fittings on aluminum jacketed lines with 1/8" thick dry coat of vinyl acrylic mastic reinforced with glass cloth. In addition, provide preformed aluminum fitting jackets for outdoor fittings.
- D. Seal all joints on fitting covers with silicone sealant.

2.3 DUCT INSULATION, INTERNAL:

A. Glass fiber acoustical/thermal insulation complying with NFPA 90A and UL 181 and having an erosion resistant heavy coating on the air side treated with an anti-microbial agent which does not support mold, bacteria nor fungus growth when tested in accordance with ASTM C1071, ASTM G21 and G22. NRC not less than 0.80 at 1-1/2" thickness, minimum density 1-1/2 lb/cu. ft., and maximum friction correction factor at 2000 fpm average velocity 1.15 (per TIMA test method AHS-1S2-76U). Minimum thermal conductance at R6 = 0.17 (ASTM C177). Knauf "Duct Liner E-M", Certainteed "Tough Guard" or approved equal. Submit sample to obtain approval for other manufacturers.

2.4 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS:

- A. Flexible glass fiber insulation with foil-scrim-kraft (FSK) facing. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 1 lb./cu. ft., maximum thermal conductivity at 75°F mean temperature 0.26 BTU/(hr)(sq. ft.)(°F/in).
- B. Fire-retardant foamed plastic insulating board having a thermal conductivity at 75° mean temperature not exceeding 0.27 BTU/(hr)(sq.ft.)(°F/in.). Fasten in place and seal joints with adhesive in accordance with insulation manufacturer's instructions.
 - 1. Finish: Vimaso 749 vapor-block mastic color grey.
 - 2. Armacell, Aeroflex or Normaco.

2.5 DUCT INSULATION, EXTERNAL, FOR EXPOSED INDOOR DUCTS:

- A. Fire retardant foamed plastic insulation. Paint with Vimaso 749 vapor-block mastic color grey. (Do not use in plenums unless complies with Article 1.2.) Armacell, Aeroflex or Normaco.
- B. 6 lb/cu. ft. fiberglass board with FSK facing and thermal conductivity not exceeding 0.22 BTU/(hr)(sq.ft)(°F/in) at 75°F mean temperature.

2.6 DUCT INSULATION, EXTERNAL, FOR EXPOSED OUTDOOR DUCTS:

- A. 6 lb/cu. ft. fiberglass board with FSK facing and thermal conductivity not exceeding 0.22 BTU/(hr)(sq.ft)(°F/in) at 75°F mean temperature.
- B. Cover insulation with aluminum jacket sealed weather tight.

PART 3 - INSTALLATION

3.1 HVAC PIPING:

- A. Refrigerant suction lines and hot gas bypass lines: "Foamed plastic pipe covering", 3/4" thick.
- B. AC Unit drain lines: "Foamed Plastic Pipe Covering", 1/2" thick.

3.2 DUCT INSULATION, INTERNAL:

- A. Apply in accordance with SMACNA "Duct liner application standard" over full coverage adhesive. Coat all edges with adhesive and seal all punctures or tears with mastic before installing ducts. Cut liner to assure overlapped and compressed longitudinal corner joints. Provide mechanical fasteners and metal nosings as noted below:
 - 1. For all velocities, provide metal nosings on upstream edge of liner at connections to equipment: Fans, coils, dampers, AC Units, sound absorbers, etc.

- 2. For velocities up to 2,000 feet per minute: start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 12" o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere locate fasteners a maximum of 18" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break.
- 3. For velocities from 2,001 to 4,000 feet per minute: start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 6" o.c. around the perimeter of the duct, except that they may be a maximum of 6" from a corner break. Elsewhere locate fasteners a maximum of 16" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break. In addition to the adhesive edge coating of transverse joints, coat any longitudinal joints with adhesive.
- 4. For velocities from 4,001 to 6,000 feet per minute: same as 2 above except that metal nosing shall be installed to secure liner at all upstream transverse edges.
- B. Thickness and extent (minimum 1-1/2" thick): All single wall supply, return and OSA duct. (Do not line supply duct transitions at connections to multizone AC Units or supply duct transitions to air heat pumps or other fan outlets smaller than 6 square feet outlet area. Insulate these transitions as specified for externally insulated supply ducts.) Provide nosing on duct liner at all connections to equipment and at all leading edges (no adjacent upstream liner). Nosing shall fit outside the equipment flange.

3.3 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS:

- A. For flexible glass fiber insulation:
 - 1. Lap jacket and vapor seal all joints and seams with suitable mastic.
 - 2. On rectangular and flat oval ducts 30" wide and wider, support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.
 - 3. Thickness and Extent: All sheet metal supply and outside air ducts not specified to be lined: Minimum 2" thick except as noted below. Note: Conical and straight spin-ins on both lined and unlined ducts shall be insulated as noted below. (See Foamed Plastic Insulation below.)
- B. All metal surfaces of ceiling diffuser (CD) located above the ceiling: 2" thick (seal air tight to diffusers).
- C. Foamed Plastic Insulation:
 - 1. Insulate portions of fire damper sleeves in insulated ducts, which are not concealed in walls, partitions and floors as specified with 3/4" thick foamed plastic insulation. Do not extend the insulation through the wall, floor or partition. Seal to wall and glass fiber insulation (or if lined duct seal foamed plastic insulation to duct with 3" lap over liner). On externally insulated duct, lap glass fiber insulation over foamed plastic and seal to foamed plastic.
 - 2. Insulate all flexible connectors in sheet metal ducts with 1" thick foamed plastic sheet with joints sealed. Extend insulation minimum 3" upstream and downstream of flex connector joints and seal to sheet metal duct.

- 3. Insulate portions of lined ducts at manual dampers with 3/4" thick foamed plastic insulation overlapping the liner a minimum 3" upstream and downstream of the damper. Seal foamed plastic insulation to duct.
- 4. Insulate all unlined ducts with dampers, all conical branch duct fittings and straight branch duct spin-ins with 3/4" thick foamed plastic insulation. Glass fiber insulation on the branch ducts shall overlap foamed plastic insulation on the conical fittings and spin-ins. Seal fiberglass to foamed plastic. For connections of flexible duct to spin-ins or conical branch duct fittings, connect flexible duct inner liner to sheet metal with specified clamps and lap outer liner and insulation over foamed plastic and clamp with Panduit strap. Seal flex duct outer cover to spin-in or conical fitting insulation. Insulation contractor shall submit sample of spin-in and conical fitting insulation and flexible duct connection for approval.
- D. Insulate portions of fire damper sleeves in insulated ducts which are not concealed in walls, partitions and floors as specified in A or B above. Do not extend the insulation through the wall, floor or partition.

3.4 DUCT INSULATION, EXTERNAL, FOR SINGLE WALL EXPOSED DUCTS:

- A. Insulate all exposed supply, return and outside air ducts and exposed return bends, headers and casings of all duct mounted coils not specified to be lined with 1" thick foamed plastic insulation cemented in place with adhesive in accordance with insulation manufacturer's instructions.
- B. Insulate all exposed supply, return and outside air ducts located in Mechanical Room with 2" thick 6#/cu. ft. fiberglass board with FSK jacket. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic.
- C. Cover all angles, seams and joint reinforcing with insulation and seal vapor tight.

3.5 DUCT INSULATION, EXTERNAL, FOR SINGLE WALL EXPOSED OUTDOOR DUCTS:

- A. Insulate all exposed outdoor supply, return and outside air ducts with 2" thick 6#/cu. ft. fiberglass board with FSK jacket. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic.
- B. Cover all angles, seams and joint reinforcement with insulation and seal vapor tight. Finish with aluminum jacket cover sealed weather tight.

END OF SECTION

SECTION 23 50 00

HEATING AND AIR CONDITIONING EQUIPMENT AND SPECIALTIES

PART 1 - GENERAL

- 1.1 SCOPE:
 - A. Section 23 05 00 "General Provisions HVAC" shall apply to and become part of this Section.

PART 2 - EQUIPMENT AND SPECIALTIES

2.1 AIR COOLED CONDENSING UNITS:

- A. Include one or more reciprocating compressors, condenser and condenser fan, all enclosed in a single casing. Provide separate refrigerant circuit for each compressor.
- B. Casings: aluminum or galvanized steel designed for outdoor installation. (Galvanized steel casings shall be finished with enamel over bonderizing.) Equip casings with access panels, condenser inlet guards and fan outlet guards. Provide padlock connections for power and control access panels.
- C. Compressors: bolted hermetic compressors, spring isolated, with reversible oil pumps and at least 2 steps of unloading, actuated by suction pressure. Refrigerant: R410A.
- D. Condensers: aluminum fins securely bonded to seamless copper tubes. Condenser fans: direct driven propeller fans, resiliently mounted, with weather protected fan motors.
- E. Provide (liquid receiver if condenser coil will not contain entire system charge where 80% full at 100F) suction and discharge service valves and liquid stop valve.
- F. Controls: factory wired and located in a readily accessible location. Provide (2 step) line voltage contactor and both temperature and current sensitive overload devices and phase loss protection for compressor motor, cycle timer to limit compressor starts to 5 or 6 minute intervals, oil pressure switch, high and low pressure switches and crankcase heater. Provide field or factory mounted low-ambient-start devices and variable air volume or fan cycling head pressure controls for stable starting and operation in ambients scheduled.
- G. Mount condensing units on poured in place pad as shown.
- H. Provide 5 year non-prorated compressor parts warranty.
2.2 VARIABLE FREQUENCY SPEED CONTROLLERS:

- A. For each motor so scheduled provide a variable frequency, AC, solid state, induction motor speed controller. The speed controller shall be self-contained, with all components enclosed in a NEMA 1 cabinet and be capable of operation 1-40 degrees centigrade. The controller shall be capable in operating with <u>+</u> 10% of system voltage and 60 Hz <u>+</u> 3% frequency variation. It shall have 10-1 frequency range. The speed controller shall be floor mounted.
- B. The speed controller shall be automatically controlled by a pneumatic 3-15 psi signal, 10 volt dc, 4-20 milliamps, control signal. 20 milliamps shall correspond to maximum speed and 4 milliamps shall correspond minimum speed. The controller shall have capability to invert the input signal, if necessary due to process requirements. Coordinate control signal with controls contractor.
- C. The VFD's shall limit harmonic distortion reflected onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications, by utilizing the standard 3% nominal impedance integral ac three-phase line reactor. An isolation transformer or external line reactor may be substituted as an option. Provide line reactor on the output of the drive to limit standing wave and to prevent damage to the VFD and motor. <u>All VFD's for motors 100 HP or more shall be Active Front End (AFE) utilizing insulated gate bipolar transistors (IGBTs) instead of diodes in the rectifier circuit. Active Front End (AFE) drives shall limit total harmonic distortion to 3%.</u>
- D. Total harmonic distortion shall be calculated under worst case conditions in accordance with the procedure outlined in IEEE Standard 519-1992. Copies of these calculations shall be provided in the submittal. The contractor shall provide any needed information to the VFD supplier three (3) weeks prior to submittal date.
- E. If the system cannot meet the IEEE 519-1992 harmonic levels with VFD's provided with the standard input line reactor or optional input isolation transformer, the VFD manufacturer shall supply a twelve pulse, multiple bridge rectifier ac to dc conversion section with a phase shifting transformer.
- F. The speed controller shall be completely prewired at the factory and shall have one input power connection and one output power connection to the motor. If isolation transformer, line filters, or other equipment is required external to the speed controller cabinet, then all interconnecting wiring shall be provided at no extra cost to the Owner. See Electrical single line wiring diagram for input wire size and lug size required.
- G. Sound power developed by speed controllers shall not numerically exceed NC-75 sound pressure and by motors shall not exceed 4 dB(A) above specific motor across the line delivered sound pressure levels in 2nd through 8th octave bands.
- H. VFD programmable parameters shall be adjustable from the keypad. The display shall be alphanumeric, programmable with status indicators. The display shall be in plain English words for parameters, status and diagnostic messages. Alphanumeric codes and/or tables are unacceptable.
- I. Standard advanced programming and trouble-shooting functions shall be available by using a personal computer's RS-232 port or RS-485 port and Windows[™] based software. In addition, the software shall permit control and monitoring via the VFD's RS-232 port or RS-485 port. VFD manufacturer may offer a BAS serial link and field bus adapter for standard protocols.
- J. Provide two (2) programmable Form C contact outputs (one for motor running and one for fault trip) and one (1) programmable 24VDC open collector output (for drive ready).

- K. Provide six (6) digital inputs for start/stop, local/remote, external interlock, two preset speeds and run enable.
- L. The drive shall record and log faults. The VFD shall display all faults in plain English.
- M. The variable frequency drive(s) and all components shall be designed, manufactured and tested and approved in accordance with the latest applicable ANSI, IEC, UL, CUL, CSA and NEMA standards. Each drive shall be rated to withstand a minimum of 65,000 amps fault current. (Verify available fault current with electrical.)
- N. The supplier of the drive assembly shall be the manufacturer of the electromechanical power components used within the assembly, such as bypass contactors, circuit breaker, fused disconnect switch devices when specified.
- O. The supplier of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- P. The VFD's shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a two-step operation. Adjustable Current Source VFD's are not acceptable. Insulated Gate Bipolar Transistors (IGBT's) shall be used in the inverter section. Bipolar Junction Transistors, GTO's or SCR's are not acceptable.
- Q. The VFD's shall be capable of operating any NEMA Design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the VFD. VFD carrier frequency shall be limited to 3-8 kHz for optimum motor performance.
- R. The VFD's shall be able to start into a spinning motor. The VFD's shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the VFD's shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.
- S. The speed controller shall incorporate the following minimum features:
 - 1. Door interlocked circuit breaker or disconnect switch with input fuses capable of being locking in off/open position.
 - 2. All control inputs isolated from ground and power.
 - 3. Hand-off-automatic selector (on face of panel).
 - 4. Ground fault protection, over current, over voltage, under voltage, over temperature, loss of speed reference, and UL 5086 motor overload protection.
 - 5. Pilot light indication for VFD and bypass modes (on face of panel).
 - 6. Individual acceleration/deceleration adjustments.
 - 7. Maximum and minimum speed adjustments.
 - 8. 120V AC control power transformer for low voltage control that can easily interface with building safe interlock circuits.

- 9. Solid State microprocessor based logic for starting and stopping motors.
- 10. One analog output signal for output frequency.
- 11. Insensitivity to incoming phase rotation.
- 12. Auto reset with coast down timer with 0.05 second dropout (after power or thermal shutdown).
- 13. Output current limiters.
- 14. Motor stall protection.
- 15. Manufacturer's warranty of 2 years from date of start-up.
- 16. Output isolation contactor.
- 17. Bypass contactor mechanically and electrically interlocked with the output isolation contactor.
- 18. Overload relays for bypass contactor.
- T. Provide factory check-out and start-up service.
- U. Speed controllers shall be suitable for use with current shown on the Electrical drawings.
- V. Speed controllers shall be ABB ACH-580, Danfoss, Reliance, Square D, Cutler-Hammer.

2.3 PACKAGE AC UNITS (ALL ELECTRIC): (AHU-1, AHU-2)

- A. Factory assembled packaged heating and cooling unit with all operating components assembled together in a weather-proof casing designed for outdoor installation.
- B. Casing: Galvanized steel not lighter than 18 gauge with epoxy primer and baked enamel finish. All supply and return ducts shall pierce the bottom of the unit within the curb.
- C. Mount each unit on a pre-fabricated galvanized steel curb contoured to fit unit with pressure treated wood nailer for flashing attachment.
- D. Refrigeration components shall include hermetic compressors with crankcase heaters, safety cut-outs for oil pressure and high and low pressure and motor temperature, direct expansion cooling coil, air cooled condenser with direct driven propeller condenser fan and weather protected fan motor and insulated refrigeration piping and specialties, hot gas reheat (where scheduled). Equip condenser fan with discharge guard. Equip condenser coils with hail guards.
- E. Condenser coil coating: Equip condenser coils with factory applied epoxy coating for seacoast environments.
- F. Refrigerant: R-410A.
- G. Electric heaters shall comply with Section 235000 "Electric Duct Heaters".

- H. Outside Air Economizer: Provide factory installed outside air enthalpy economizer with barometric or powered relief damper (as scheduled). Provide automatic damper to prevent outside air entry during "off" cycle.
- I. Filters: Provide filter section with 2" thick pleated MERV 8 filters.
- J. Demand Control Ventilation: Provide factory installed demand control ventilation where scheduled.
- K. Provide unit with single point power connection for all components, phase monitoring and protection from phase loss, phase imbalance, and phase reversal.
- L. Provide unit with 304 stainless steel double sloped condensate drain pan.
- M. Provide unit with motorized outside air damper.
- N. See "Motors and Starters."
- O. Where schedule provide variable frequency drives. VFD's shall comply with Section 235000 "Variable Frequency Drives". Fan motor shall be inverter duty rated.
- P. Provide 5 year non-prorated parts and labor warranty on complete unit including compressors.
- Q. Unit shall be by Trane, Daikin, Carrier or York.

2.4 SPLIT SYSTEM AIR CONDITIONERS - SMALL:

- A. Split system air conditioners shall consist of a wall mounted indoor section, outdoor condensing unit, connecting refrigerant piping, and electronic controls. System shall be UL rated.
- B. Indoor unit shall consist of centrifugal evaporator fan(s), evaporator coil, drain pan with condensate pump and safety switch, all enclosed in a plastic casing equipped with adjustable supply grille and return air grille. Provide 3 pole disconnect switch.
- C. Outdoor unit shall consist of compressor, condenser coil, condenser fan, and controls, all enclosed in a metal grilled cabinet suitable for pad mounting. Provide refrigerant piping kit, pre-insulated, properly sized for capacity shown. (See drawings to determine length.) Provide low ambient operation to 20°Fdb outdoors.
- D. Controls shall consist of a wall mounted remote controller utilizing a microprocessor. Functions shall include:
 - 1. Computerized dehumidification.
 - 2. Operation mode setting.
 - 3. Self-diagnostic display.
 - 4. Room temperature display.
 - 5. Twenty-four hour on-off timer.
 - 6. Fan speed indicator.

- 7. Memory.
- 8. Low ambient operation.
- E. Split system air conditioners shall be Trane-Mitsubishi, Carrier, Daikin, Gree or approved equal.

2.5 SPLIT SYSTEM HEAT PUMP - VRF:

- A. Split system air conditioners shall consist of a wall or ceiling mounted indoor section, outdoor heat pump unit, connecting refrigerant piping, and electronic controls. System shall be UL rated.
- B. Indoor unit shall consist of centrifugal evaporator fan(s), evaporator coil, drain pan with condensate pump and safety switch, all enclosed in a plastic casing equipped with adjustable supply grille and return air grille. Provide 3 pole disconnect switch.
- C. Outdoor unit shall consist of compressor, condenser coil, condenser fan, and controls, all enclosed in a metal grilled cabinet suitable for pad mounting. Provide refrigerant piping kit, pre-insulated, properly sized for capacity shown. (See drawings to determine length.)
- D. Controls shall consist of a wall mounted remote controller utilizing a microprocessor. Functions shall include:
 - 1. Computerized dehumidification.
 - 2. Operation mode setting.
 - 3. Self-diagnostic display.
 - 4. Room temperature display.
 - 5. Twenty-four hour on-off timer.
 - 6. Fan speed indicator.
 - 7. Memory.
- E. Split system heat pump VRF shall be Trane-Mitsubishi, Carrier, Daikin, Gree, or approved equal.

2.6 SPLIT-SYSTEM 100% OUTSIDE AIR UNITS (ALL ELECTRIC): DOAS-1

- A. Horizontal or vertical air handling units: factory fabricated units having capacity shown, consisting in general of a filter section, an access section, a cooling coil section, drip pan, a hot gas reheat section, supply fan sections, and supply air electric heat, all the product of a single manufacturer. Provide all sections of the same frame size with support rails for all sections. Mount units on ribbed neoprene pads on concrete curbs as shown. Electric heat to be SCR modulating control.
- B. Casing: not lighter than 18 gauge galvanized steel, all sections of casing insulated with R6.5 polyurethane foam insulation. All sections shall be of double wall construction with solid 26 gauge galvanized steel liner on air side of all sections.

- C. Drain pans: double construction with insulation between pans and 16 gauge type 304 stainless steel inner pan.
- D. Coil sections shall be double wall solid construction with the coils scheduled. Coils shall comply with the requirements below for coils.
- E. Provide spacer sections for installing control bulbs between pre-heat and cooling coils. At least 18" space must be provided between preheat and cooling coils.
- F. Provide hinged and latched access doors in casings at fan sections, filter sections, plenum sections, upstream and downstream from cooling coils and elsewhere as shown and/or required for access to equipment and/or controls. Construct doors with 1-1/2" insulation between 2 sheets 24-gauge galvanized steel. Set doors in frames arranged so that doors will be flush with exterior of casing. Equip each door with at least 2 hinges and 2 sets of double acting latches. Latches shall be made from nonferrous metal, with a lever handle on the outside and a lever handle on the inside of the casing. Lever handle on the outside of the casing shall cam over a door pull with a stop. Doors shall be reinforced to prevent wracking and warping. Install gaskets at all section connections.
- G. Automatic dampers shall comply with the requirements for automatic dampers below.
- H. Air filters: see equipment schedule and "Air Filters". Provide side access filter sections, complying with the requirements under "Air Filters".
- I. Provide vapor proof marine lights in all sections. Lights shall be factory wired with switches located next to access door. Wiring to be in compliance with NEC and Division 26.
- J. Fans: plug fan backward curved blade centrifugal fans, complying with the requirements for "Centrifugal Fans, General" statically and dynamically balanced to a peak vibration velocity of 0.157 inch/second, with corrosion resistant coating. Bearings shall be minimum L₅₀ 200,000 hour self-aligning grease lubricated ball bearings. Grease fittings shall be extended to accessible locations after units are installed. Fan and fan motor shall be mounted on spring isolated base inside unit, and snubbing isolators shall be provided for discharge flexible connections.
- K. Air Cooled Condensing Units: Include one or more variable capacity scroll compressor(s), condenser and condenser fan, all enclosed in a single casing. Provide separate refrigerant circuit for each compressor.
- L. Casings: aluminum or galvanized steel designed for outdoor installation. (Galvanized steel casings shall be finished with enamel over bonderizing.) Equip casings with access panels, condenser inlet guards and fan outlet guards. Provide padlock connections for power and control access panels.
- M. Compressors: 10-100% variable capacity scroll compressors, spring isolated, with reversible oil pumps. Refrigerant: R410A.
- N. Condensers: Polymer E-coated condenser coil, aluminum fins securely bonded to seamless copper tubes. Modulating hot gas reheat, ECM/VFD controlled condenser fans.
- O. Controls: factory wired and located in a readily accessible location.
- P. Mount condensing units on poured in place pad as shown.
- Q. Provide 5 year non-prorated compressor parts warranty.

R. Units shall be Aaon, Desert Air, or approved equal.

2.7 IN-LINE CENTRIFUGAL FANS:

- A. AMCA approved air and sound rated direct or belt driven fans as scheduled, complete with V-belt drives sized for 50% overload, self aligning grease lubricated ball bearings, adjustable pitch motor pulleys, adjustable motor bases and statically and dynamically balanced backward curved blade wheels, all enclosed in a galvanized steel housing with inlet bell and outlet duct collars. (Fan wheel and motor assembly shall be hinged for access.)
- B. Fans shall be Greenheck type SQ, Carnes, Peerless, Acme, Penn or Loren Cook.

2.8 CEILING EXHAUST FANS:

- A. AMCA rated direct driven centrifugal fans designed for ceiling mounting, complete with removable white aluminum, ceiling grille insulated housing, fan speed controllers, rubber-in-shear isolators, disconnect switch, and integral back draft damper. Max. noise level: 5 sones.
- B. Fans: Greenheck SP, Acme, Penn or Loren Cook.

2.9 ELECTRIC WALL HEATERS:

- A. UL listed recessed convection heaters with finned sheathed heating elements, resiliently mounted direct driven propeller fan with motor heat shield, concealed thermostat, concealed on-off switch, high limit controls, and junction box for connecting power wiring.
- B. Cabinets: 16 gauge steel, with pencil proof welded steel bargrilles (bars 1/16" x 3/8" minimum). Equip cabinet with adjustable recessing frame. Finish: Baked enamel, over bonderizing. Architect will choose color from manufacturer's standard selections.
- C. Electric wall heaters: 2 KW and larger, Markel 3400 series, less than 2 KW, Markel Series 3120, Erincraft AWH or equal.

2.10 ELECTRIC DUCT HEATERS:

- A. Slide-in heaters with all sheet metal parts inside duct aluminized or galvanized steel, listed in the Underwriters Laboratories, Inc. Electrical Appliance & Utilization Equipment List.
- B. Heaters shall have ceramic supported nichrome wire elements, flanged mounting plate, control box and 1/2" insulation between mounting plate and control box. Provide spacers at terminal end of heater so that internal duct insulation will not cause hot spots. Provide general purpose control boxes for indoor heaters and weather-tight control boxes for heaters located outdoors. (Connections between control box and duct shall be airtight under 1" WG static pressure.)
- C. Control box shall contain non-fused disconnect switch, fuse blocks and fuses for each phase, 3 pole contactors for 3 phase heaters and 2 pole contactors for single phase heaters other than 277 and 120 volt heaters. (Contactors shall be designed for quiet operation.) Contactors shall be factory wired to terminal strips.

- D. Controls: SCR modulating control with factory wired automatic high limit control, air flow switch, and a supplementary independent thermal device to disconnect all power circuits in case automatic high limit fails, factory supplied control circuit transformers suitable for 24 volt control, factory wired to terminal blocks in control box.
- E. Provide staging as shown.
- F. Provide camlocked duct access doors at electric heaters.

2.11 DEDICATED OUTSIDE AIR ENERGY RECOVERY UNITS (ENTHALPIC CORE): ERU-GYM

- A. Units shall be packaged energy recovery ventilators. Units shall have the ability to transfer sensible and latent energy at an effective rate of not less than 75%. Units shall be horizontal flow. Units shall be capable of operating at outdoor ambient temperatures up to 130°F and down to 5°F without the need for a frost control accessory. Units shall not require a condensate drain. Units shall be factory assembled, fully wired and tested prior to shipment. Wiring shall require only a single point power connection to the service disconnect and interconnection of low voltage control wires from the unit to a remote control device. Units shall be shipped with complete installation, operating and maintenance instructions. Units shall be U.L. listed.
- B. Units shall contain an integral enthalpic core heat exchanger constructed of aluminum and polymer sheets.
- C. All components shall be contained within a 16 or 18 gauge galvanneal steel cabinet finished with a polyester powdercoat oven baked enamel. All components shall be readily accessed through removable supply and exhaust access panels equipped with handles. Internal cabinet components shall be formed galvanized steel and shall provide structural support to side and top panels. Unit shall be fitted with lifting straps attached to four corners. All necessary cabinet and internal partitions shall be fully insulated with 1" rigid insulating board to prevent migration of moisture and provide a smooth aluminum foil surface to avoid bacterial growth and facilitate cleaning. Units shall have horizontal discharge and intake openings.
- D. Supply and exhaust fans shall be direct drive backward inclined fans with ball bearing support collars. Fan motors shall be continuous duty, resilient mount, ball bearing construction with automatic thermal overload protection and class B insulation. Provide preprogrammed variable frequency drives for each fan.
- E. Filters shall be MERV 13 pleated type, 2" thick. Provide filters for both outside air and exhaust air streams. Provide clean filters at final and one complete set for Owner's first filter change.
- F. Provide all controls, remote temperature and humidity controller, including motor starters, disconnect switch, fuses and terminal strips.
- G. Sequence of Operation:
 - 1. Occupancy:
 - a. The controller shall enable occupancy via BAS communication signal.
 - b. The controller shall perform the following functions in the occupied mode:
 - 1) Open the outdoor air damper and exhaust air damper.

- 2) Enable the supply fan upon closure of the outdoor air damper end switch.
- 3) Enable the exhaust fan 30 seconds after closure of the supply fan pressure switch.
- c. The controller shall disable occupancy via BAS communication signal.
- d. The controller shall perform the following functions after occupancy is disabled.
 - 1) Cooling, dehumidification, or heating shall be disabled.
 - 2) After 30 seconds (adj.) the supply fan shall be disabled.
 - 3) Outdoor air damper shall be de-energized and fail closed.
 - 4) Exhaust air damper shall be de-energized and fail open.
- 2. Night Setback (No Occupancy):
 - a. Unit shall enable night setback under any one of the following conditions.
 - 1) Relative humidity in the space is greater than 55% (adj.) OR dew point in the space is greater than 53°F (adj.).
 - 2) Space temperature is greater than 80°F (adj.).
 - 3) Space temperature is less than 60°F (adj.).
 - b. The controller shall perform the following functions in the night setback.
 - 1) Supply fan shall enable.
 - 2) Temperature and humidity control sequence shall enable.
 - c. The controller shall disable night setback under any one of the following conditions.
 - 1) Space conditions are satisfied.
 - 2) Internal time clock in microprocessor controller determines unoccupied mode.
 - 3) Dry contact for occupied mode is closed.
- 3. Temperature Control:
 - a. The controller shall enable the temperature control sequence when any of the following conditions are met.
 - 1) Occupancy mode.
 - 2) Night setback mode enabled.

- b. The supply air temperature setpoint shall be determined by the following inputs. Space temperature and humidity control with supply air reset or PID loop driven by user-defined space temperature setpoint within the supply minimum and maximum set points.
- c. The controller shall enable the following modes of operation in order to maintain the supply air temperature setpoint.
 - 1) Heating.
 - 2) Energy recovery.
 - 3) Cooling.
- d. Heating:
 - 1) The controller shall enable heating under the following condition. Temperature control PID loop determines heating required due to the difference between the supply air temperature and supply air temperature setpoint.
- e. Cooling:
 - The controller shall enable cooling under the following conditions. (a). Temperature control PID loop determines cooling required due to the difference between the supply air temperature and supply air temperature setpoint.
- 4. Dehumidification:
 - a. The controller shall enable the dehumidification control sequence when either of the following conditions is met. Space temperature and humidity control with supply air reset. Outdoor dew point is greater than the outdoor air dew point setpoint AND the outdoor air temperature is greater than the supply air temperature setpoint OR the space relative humidity is greater than the space relative humidity setpoint AND the space dew point is above 45°F.
 - b. The controller shall perform the following functions in the dehumidification mode.
 - 1) Modulate cooling capacity to maintain the coil leaving air temperature setpoint
 - 2) Modulate hot gas reheat valve to maintain the supply air temperature setpoint.
- 5. Cooling & Refrigeration Air Cooled Packaged Direct Expansion:
 - a. In cooling mode the controller shall perform the following functions.
 - 1) Enable the Digital Scroll [™] compressor and modulate capacity to maintain supply air temperature setpoint.
 - If the Digital Scroll[™] compressor is not able to maintain the supply air temperature, additional fixed stages of capacity shall be enabled and the Digital Scroll[™] shall continue to modulate to maintain the supply air temperature setpoint.
 - 3) If the combination of multiple compressors provided lowers the supply air temperature below its setpoint, the controller shall disable one or more fixed stages of capacity.

- b. In dehumidification mode the controller shall perform he following functions.
 - 1) Enable a fixed stage of capacity to maintain or exceed the evaporator coil leaving air temperature setpoint.
 - 2) Modulate the hot gas reheat valve to maintain the supply air temperature setpoint.
 - 3) Enable an additional fixed stage of capacity to maintain or exceed the evaporator coil leaving air temperature setpoint.
 - 4) Enable the Digital Scroll[™] compressor to maintain the evaporator coil leaving air temperature setpoint.
- c. To maintain a consistent condensing temperature in cooling and dehumidification mode, the controller shall enable and modulate all condensing fans with EC motors at the same speed to maintain a condensing temperature of 110°F.
- 6. Heating Electric:
 - a. In heating mode the unit controller shall perform the following actions.
 - 1) Enable electric heat.
 - 2) Modulate capacity to maintain the supply air temperature setpoint.
- H. Units shall be Valent, Greenheck or approved equal.

2.12 REFRIGERANT SPECIALTIES:

- A. Install moulded desiccant core filter dryer in each liquid line. Provide throwaway dryers for lines 1/2" and smaller. Provide replaceable core dryers for lines 5/8" and larger. Dryers shall be Sporlan "Catchall". For heat pump units filter dryer to be bi-directional flow.
- B. Install moisture indicating sight glass in each liquid line. Install a refrigerant charging valve in each liquid line near each sight glass.
- C. Service valves: wing cap valves, Henry with locking cover.
- D. Expansion valves: thermostatic valves with external equalizers, Sporlan.
- E. Hot gas bypass valves: self contained valves sized to pass gas flow at last step of compressor unloading and shall discharge between expansion valve outlet and distributor. Sporlan.
- F. Evaporator pressure regulating valve: sized to pass full suction gas flow rate with a pressure drop not exceeding 2 psi.
- G. Install solenoid valve in each liquid and hot gas bypass line. Hot gas solenoid valve shall be equipped with a high temperature coil. Solenoid valves for heat pump units shall be bi-directional flow.

END OF SECTION

SECTION 23 60 00

AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE:

A. Section 23 05 00 – "General Provisions – HVAC" shall apply to and become part of this Section.

1.2 SHOP DRAWINGS:

- A. See Section 23 05 00 "General Provisions HVAC".
- B. Ductwork Shop Drawings shall include details of duct construction: seams, joints, gauges, reinforcing, elevations, and hanger details for each pressure class and size range together with details of turning vanes, branch connections, dampers and access doors. Include access door locations and sizes. Identify on the shop drawings duct sections as they will be identified for fabrication and installation. Provide section drawings of locations where ducts cross or demonstrate with elevations that ducts will fit.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Air terminal submittal data shall include, for each terminal, both radiated and discharge sound power in DB re 10 to the minus 12 watts in octave bands 2 through 7. All air terminal controls shall be installed in a unit mounted control panel and shall be UL listed as an assembly.

2.2 GRILLES, REGISTERS AND DIFFUSERS:

- A. General: Air devices may be Price, Titus, Krueger, Nailor, or approved equal. Titus part numbers are given for reference. Coordinate border and frame types for air devices with ceiling types as shown on Architectural Reflected Ceiling Plan.
- B. Rectangular Louver Face Diffusers One-, Two-, Three-, Four-Way or Corner Throw (LD or CD): Fixed pattern louver face diffusers, all aluminum with white enamel finish, removable cores latched in place, opposed blade dampers, adjustable multiblade scoops, #TDC,-AA.
- C. Supply Registers (SR): Adjustable vertical face bars, adjustable horizontal rear bars, opposed blade dampers, plaster frames, adjustable multiblade scoops, all aluminum with prime coat finish: #272.
- D. Drum Louvers (DL): Adjustable vertical blades and rotating drum with optional opposed blade damper with screwdriver operator accessible through discharge of DL. All aluminum finish with prime coat.

- E. Wall Return Registers (WRR): All aluminum, aluminum lacquer finish, horizontal bars fixed at about 35° angle, plaster frames, opposed blade damper #350. (Wall Return Grilles {WRG} Delete opposed blade damper).
- F. Ceiling Return Registers (R): All aluminum, 1/2" x 1/2" x 1/2" cube core, plaster frame, opposed blade dampers, white enamel finish #50F. Omit dampers for registers not attached to return ductwork.
- G. Ceiling Exhaust Registers (E) and Ceiling Transfer Registers (T): Same as Ceiling Return Registers.

2.3 FLEXIBLE DUCT CONNECTIONS:

- A. Install Neoprene coated glass cloth flexible connections at all duct connections to all fans, all AC Units and all powered induction units.
- B. Install flexible connections in all ducts at building expansion joints.

2.4 DUCTWORK - GENERAL:

- A. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanship manner with adequate bracing and cross breaking to prevent breathing, rattling, and vibration. <u>DO NOT USE</u> <u>SNAP-LOCK SEAMS</u>.
- B. Install Duro-Dyne locking quadrants and Duro-Dyne end bearings on all splitters and manual volume dampers located above accessible ceiling and Young #315 regulator, and Duro-Dyne end bearings elsewhere. Provide stand-offs for quadrants on externally insulated ducts. (Refer also to "Sheet Metal Specialties.")
- C. Duct dimensions are **net dimensions inside insulation**. Determine gauges by actual duct size.
- D. All duct turns except as noted below for 90 degree turns shall be radiused with a centerline radius of 1.5 times the duct width in the plane of the turn. At the contractor's option, 90 degree turns may be square throat elbows vaned to provide a dynamic loss coefficient ("C") not greater than 0.2 or shall be radiused. Do not use "push on" vane runners. Duct turns less than 20 degrees may be mitered. Do not use off-sets that reduce the cross-sectional area of the duct.
- E. Duct Sealing: Seal duct seams and joints after assembly as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to solvent based United Duct Sealer.
 - 1. Class A Seal: Seal all joints and seams and leak test at pressure specified. Leakage cfm per 100 sq. ft. duct surface area shall not exceed 8 times the square root of the test pressure in inches of water and no leaks shall be audible.
 - 2. Class B Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.
 - 3. Class C Seal: Seal entire circumference of all transverse joints.

- 4. Class D Seal: Seal corners of transverse joints.
- F. Access Doors: Provide access door at all control components in ductwork, control dampers, smoke detectors, airflow stations, static pressure sensors, humidifier manifolds, and elsewhere as required to access equipment.

2.5 DUCTWORK – LOW PRESSURE INSULATED ROUND DOUBLE WALL:

- A. Round insulated double wall ductwork includes all round exposed supply air ductwork where indicated on plans.
- B. Ductwork: Factory fabricated galvanized steel round spiral lock seam ducts of 26-gage for ducts up to 8" in diameter, 24 gauge for ducts from 9" to 22", and 22-gauge for ducts 24" through 36" in diameter. Lock seams shall be spaced on not more than 3" centers for ducts up to 5" in diameter, 6" centers for ducts from 6" through 10", and 8" centers for ducts 12" and over in diameter.
- C. Fabricate fittings by continuous brazing or electric welding. Thickness of metal for round fittings: as specified for longitudinal seam ducts but not less than 22 gauge. Elbows shall have centerline radius of 1.5 diameters, 5 piece construction over 8" diameter, die stamped 8" and smaller. 90-degree take-offs shall be made with conical tees. Make connections to plenums with bellmouths.
- D. Make transverse joints using beaded slip couplings, sealing compound equal to United "Duct Seal", and sheet metal screws.
- E. Seal all concealed ducts to SMACNA Class (C) classification. All exposed round shall not be sealed.
- F. Hang ducts using 1" x 12-gauge straps at transverse joints but not more than 8'-0" apart. Strap shall completely encircle duct and shall be secured to construction with powder driven studs. Do not penetrate the ductwork with screws at the hangers.
- G. Ductwork shall be factory insulated consisting of a spiral lockseam outer shell, 1" thick fiberglass (3 pcf) insulation and an interior perforated galvanized steel liner. Outer shell shall have "paint grip" finish to accept epoxy paint finish. No adhesive labels shall be placed on the exposed surface of exposed ductwork.
- H. Duct and fittings shall be United McGill Airflow, Semco, Spiral Systems, Spiral Pipe of Texas or Eastern Sheet Metal.

2.6 DUCTWORK - LOW PRESSURE FLAT-OVAL DOUBLE WALL:

- A. Low pressure flat oval double wall ductwork shall include all flat oval ductwork where indicated on plans.
- B. Flat oval ductwork: Factory fabricated and insulated galvanized steel ducts with spiral lock seam outer shell, 1" thick fiberglass insulation inside the outer shell and interior perforated steel 24 gauge liner with mylar film between insulation and perforated liner. The outer shell shall be 24 gauge up through 24" maximum width, 22 gauge for 25 to 48", 20 gauge from 49 to 70". Interior perforated steel liner shall be minimum 24 gauge.

- C. Fabricate fittings by continuous brazing or electric continuous welding using 22 gauge up to 36" maximum width, 20 gauge 37" to 50" and 18 gauge over 50". Elbows shall have centerline radius equal to 1.5 times width in plane of bend. Make 90` take-offs with conical taps.
- D. Make transverse joints using Ductmate (Ovalmate) joints and United Duct Sealer. Reinforce ducts to limit duct wall deflection to 0.7" at 4" WGSP but as a minimum reinforce the flat side of the flat-oval ductwork, equal to the reinforcement specified for low pressure rectangular ductwork. Do not penetrate ductwork at hangers or reinforcement.
- E. Joint sealing and testing: Seal all ducts to Class "C" and pressure and leak test at 2" WG pressure class. All exposed duct shall not be sealed on exterior.
- F. Hangers: Provide hangers for flat oval ducts consisting of a P2000 Unistrut trapeze and 3/8" diameter rods. Do not penetrate the ductwork with screws at the hangers.
- G. Duct and fittings shall be United McGill Airflow, Semco, Spiral Systems, Spiral Pipe of Texas or Eastern Sheet Metal.

2.7 DUCTWORK - LOW PRESSURE RECTANGULAR DOUBLE WALL:

- A. Low pressure rectangular double wall ductwork shall include all double wall ductwork where indicated on plans.
- B. Rectangular ductwork: Factory fabricated and insulated galvanized steel ducts with Pittsburgh lock seam outer shell, 1" thick fiberglass insulation inside the outer shell and interior perforated steel 24 gauge liner with mylar film between insulation and perforated liner. The outer shell shall be 24 gauge up through 24" maximum width, 22 gauge for 25 to 48", 20 gauge from 49 to 70". Interior perforated steel liner shall be minimum 24 gauge.
- C. Fabricate fittings by continuous brazing or electric continuous welding using 22 gauge up to 36" maximum width, 20 gauge 37" to 50" and 18 gauge over 50". Elbows shall have centerline radius equal to 1.5 times width in plane of bend. Make 90` take-offs with conical taps.
- D. Make transverse joints using Ductmate (or TDC) joints and United Duct Sealer. Reinforce ducts to limit duct wall deflection to 0.7" at 4" WGSP but as a minimum reinforce the long side of the ductwork, equal to the reinforcement specified for low pressure rectangular ductwork. Do not penetrate ductwork at hangers or reinforcement.
- E. Joint sealing and testing: Seal all ducts to Class "C" and pressure and leak test at 2" WG pressure class. All exposed duct shall not be sealed on exterior.
- F. Hangers: Provide hangers for ducts consisting of a P2000 Unistrut trapeze and 3/8" diameter rods. Do not penetrate the ductwork with screws at the hangers.
- G. Duct and fittings shall be United McGill Airflow, Sheet Metal Connectors, Inc. or approved equal.

2.8 DUCTWORK - LOW PRESSURE:

A. Ductwork, Low Pressure, shall include: All supply duct, return duct, exhaust duct, and outside air duct.

- B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted below. Do not use snap-lock seam.
- C. Pressure and Seal Classes: 1" Pressure Class, Seal "C.
- D. Seal all existing supply, return and exhaust ducts which are an integral part of new or modified systems (but which are not externally insulated) as specified above for new work of the same type.
- E. Hang ducts using 1"x12-guage galvanized straps at transverse joints but not greater than 8 ft. apart.
- F. Provide galvanized sheet steel metal ducts of sizes shown on plans, construct, hang, support and reinforce in accordance with 2" Pressure Class as contained in the current edition of the SMACNA Duct Construction Standards. Use reinforcement noted for the longest side on all sides of the duct and bolt together at corners with minimum 5/16" diameter bolts. Do not penetrate duct at reinforcement with screws. **DO NOT USE SNAP-LOCK SEAMS.**

2.9 DUCTWORK LOW PRESSURE ROUND:

- A. Low pressure round ductwork includes all round supply, return, outside air, and exhaust ductwork except as specified medium pressure round ductwork.
- B. Ductwork: Factory fabricated single-wall galvanized steel round spiral lock seam ducts of 28 gauge for ducts up to 14" in diameter, 26 gauge for ducts from 15" to 26" in diameter, 24 gauge for ducts 27" to 36" in diameter, and 22 gauge for ducts over 36" in diameter.
- C. Fabricate fittings by continuous brazing or electric welding. Thickness of metal for round fittings: 26 gauge for fittings up to 14" in diameter, 24 gauge for fittings 15" to 26" in diameter, 22 gauge for all fittings over 26" in diameter. Elbows shall have a center-line radius of 1.5 diameters, 5 piece construction. Take-offs shall be 45 degree laterals. Splitters (tees) shall be reducing Y-Branch with dampers.
- D. Make transverse joints using beaded slip couplings, sealing compound equal to solvent based United Duct Seal and sheet metal screws.
- E. Provide hanger straps per SMACNA table no more than 8 ft. apart. Straps shall encircle duct. Do not penetrate ductwork at hangers.
- F. No adhesive labels shall be placed on the exposed surface of exposed ductwork.
- G. Ductwork and fittings shall be United McGill Airflow, Semco, Spiral Systems, Spiral Pipe of Texas or Eastern Sheet Metal round duct and fittings, 2" WG standard.

2.10 OUTSIDE AIR INTAKE HOOD:

- A. Factory fabricated aluminum hood with integral curb cap and birdscreen. Hinge top of hood and weld all vertical seams. Equip hood with galvanized steel curb with wood nailer. Minimum material gauges, hood 20 gauge, base 18 gauge, curb 18 gauge.
- B. Intake hood: Greenheck FGI or equal.

2.11 WEATHER LOUVERS:

- A. Louvers shall be AMCA certified 6" thick extruded aluminum drainable stationary louvers with minimum 0.08" thick blades and frame and minimum 50% free area nominal. Equip with 1/2" mesh aluminum birdscreen on inside of louver. Color to be selected by Architect. Finish to be manufacturer's Kynar 500 Fluoropolymer coating conforming to AAMA 605.2. Provide samples of color and finish to Architect for approval. Air pressure drop shall not exceed 0.15" WG at maximum air velocity of 850 FPM through free area. Water penetration shall not exceed 0.01 ounces per SF of free area.
- B. Louvers shall be Ruskin ELF6375DX or equivalent by Greenheck, or approved equal.

2.12 ACCESS DOORS:

- A. Access doors in low pressure ducts: galvanized steel frame flange mounted permanently secured to duct with a hinged gasketed access port held in place with thumb operated latches. Doors in insulated ducts: double thickness with insulation. Doors in non-insulated ducts: a single thickness. Size doors to permit removal of equipment or maintenance. Minimum 18" x 18" in ducts 20" or greater. Minimum 12" x 12" in ducts 14" to 18" and minimum 8" x 12" in ducts 10" to 12". If duct is less than 10", enlarge duct at access door and fire damper, if applicable to allow minimum 8" x 12" access door. Kees "FH" series standard pressure flanged mount. Install for flush interior on double wall doors.
- B. Mark access points in lift-out ceilings with colored vinyl stick-on discs. Locate discs on grid adjacent to point of access and coordinate location of access doors in non-accessible ceiling with General Contractor.

END OF SECTION

SECTION 23 70 00

HVAC TESTING AND BALANCING

PART 1 - GENERAL

- A. Provisions of Section 23 05 00 "General Provisions HVAC" shall apply to and become a part of this section.
- B. The HVAC testing and balancing work specified in this section shall be done by an Associated Air Balance Council (AABC) member. The Testing and Balancing Agency's (TABA) project manager shall be an AABC certified or NEBB certified testing and balancing engineer and be responsible for supervision of and certification of the work herein specified.
- C. The Testing and Balancing agency will be employed by the Owner, Architect, Engineer, building contractor or mechanical contractor.
- D. The balancing agency shall submit records of experience in the field of air and hydronic system balancing or any other data as requested by the Owner, Architect or Engineer. The supervisory personnel for the firm shall have at least five (5) years' experience, and all the employees used in this project shall be qualified technicians in this specific field.
- E. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the Owner, Architect or Engineer to determine the balancing agency's performance capability.

1.2 SCOPE:

- A. All air balance work shall be done in accordance with the AABC National Standards for Testing and Balancing Heating & Air Conditioning Systems (AABC National Standards), or NEBB National Standards edition in force at time of bidding. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.
- B. The systems to be balanced and/or tested shall include: AHU-1, AHU-2, ERU-1, DOAS-1, CU-1, EF-1, EF-2, EF-3, EF-4, EF-5, HP-1/AC-1A & AC-1B, HP-2/AC-2, HP-3/AC-3, HP-4/AC-4, HP-5/AC-5, HP-6/AC-6, HP-7/AC-7, HP-8/AC-8, HP-9/AC-9, HP-10/AC-10, HP-11/AC-11, & CU-ELEC/AC-ELEC.

1.3 DOCUMENTS:

- A. The architect will provide the balancing agency one copy of each of the following documents:
 - 1. Project drawings and specifications.
 - 2. Approved construction revisions pertaining to the HVAC systems.
 - 3. Approved submittal data on HVAC equipment and systems to be installed under Division 23.
 - 4. Approved HVAC shop drawings.

5. Approved HVAC wiring diagrams, control diagrams and equipment brochures, as appropriate.

1.4 COORDINATION:

- A. The TABA shall perform its services in close coordination with the work specified in Division 23.
- B. The plans and specifications indicate meters, valves, dampers, etc. for the purpose of adjusting the HVAC systems to obtain optimum operating conditions. In the event that any of meters, valves, dampers, etc. have been installed in a manner which will not permit their being used for their intended purpose, TABA shall so notify the Owner, Building Contractor or Mechanical Contractor so that the above items may be correctly installed as specified in the other sections of Division 23.
- C. Work included in this section shall not be started until the systems involved meet the following conditions:
 - 1. Air Distribution Systems
 - a. Systems have been completed including sealing and/or leak testing where specified with all components properly installed and ready for operation, fans are rotating correctly, motor starters have correct overload elements, variable speed drives have been put into operation and clean filters of the type required for finished system have been installed.
 - b. All dampers, including automatic dampers, are operating smoothly and without binding and that the automatic dampers close tightly and open wide without binding.
 - c. The spare sheaves as specified in Section 230500, General Provisions HVAC under Tests, Cleaning and Adjustments are on site.
 - 2. Automatic Control System:
 - a. Systems have been completed and are operating as designed.
 - 1) Installation is complete, all instruments including room thermostats have been field calibrated and operate correctly, and are set for design operating conditions.
 - 2) TABA personnel have been instructed in the proper use of and in changing set points of the various controllers including via computer or keypad if required.

1.5 NOTIFICATION FOR TESTING & BALANCING WORK TO BEGIN:

- A. When the above conditions have been met, the General Contractor and Mechanical Contractor shall notify the TABA in writing that the systems are ready for Testing and Balancing.
- B. When the TABA has been notified that the systems are ready for testing and balancing, the TABA shall inspect the various systems involved and notify General Contractor and Mechanical Contractor of any condition which may impede the TAB work (missing dampers, valves, incomplete control or electrical work, etc.).
- C. When the deficiencies noted above have been corrected, General Contractor and Mechanical Contractor shall again notify TABA that the systems are ready for testing and balancing.

1.6 INSPECTIONS:

- A. During construction the TABA shall inspect the installation of the piping systems, sheet metal work, control system and mechanical equipment.
- B. The inspections should be made when 60% of the ductwork has been installed and when 90% of the equipment has been installed.
- C. The TABA shall submit a brief written report of each inspection to the Owner, Architect, Engineer, General Contractor and Mechanical Contractor.

1.7 TESTING AND BALANCING PROCEDURES:

- A. All testing and balancing work shall be done in accordance with the AABC National Standards.
- B. Air Systems:
 - 1. Fan Speed: Test and adjust fan RPM to achieve design CFM requirements.
 - 2. Current and Voltage: Measure and record motor current and voltage of each fan.
 - 3. Pitot-tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts to obtain total CFM. If a Pitot-tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation why a traverse was not made must appear on the appropriate data sheet.
 - 4. Outside Air: Test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and discharge air temperatures with heating and cooling coil valves shut. Make allowances for heat of compression and motor heat where applicable.
 - 5. Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
 - 6. Air Temperature: Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
 - 7. Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
 - 8. Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
 - 9. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - 10. Tolerances: Test and balance each diffuser, grille and register to within -5% and +10% of design requirements.
 - 11. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.

- 12. Description: Record the size, type and manufacturer of each diffuser, grille and register on air outlet data sheets.
- 13. Minimizing Drafts: Set grille bars for throws, diffusers for patterns and adjust all diffusers, grilles, and registers to minimize drafts in all areas.
- C. Verification of Temperature Control:
 - 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
 - 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
 - 3. Verify the accuracy of the final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

1.8 TEST AND BALANCE REPORT:

- A. The test and balance report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the balancing agency's certified test and balance engineer. Any drawings submitted must be to a scale of 1/8" per foot or larger.
- B. Six (6) copies or PDF electronic file of the test and balance report are required and shall be submitted to the Architect and Engineer.
- C. The report shall contain the following general data in a format selected by the balancing agency:
 - 1. Project Number
 - 2. Contract number
 - 3. Project title
 - 4. Project location
 - 5. Project architect
 - 6. Project mechanical engineer
 - 7. Test and balance agency
 - 8. Test and balance engineer
 - 9. General contractor
 - 10. Mechanical subcontractor
 - 11. Dates tests were performed

- 12. Certification
- D. The test and balance report shall be recorded on report forms conforming to the recommended forms in the AABC or NEBB National Standards. At a minimum, the report shall include:
 - 1. Preface: A general discussion of the system, any abnormalities and problems encountered.
 - 2. Instrumentation List: The list of instruments including type, model, manufacturer, serial number and calibration dates.
 - 3. System Identification: In each report, the zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets.
 - 4. Air handling equipment test report forms: Record the following on each air-handling equipment test form:
 - a. Manufacturer, model number and serial number
 - b. All design and manufacturer-rated data
 - c. Total actual CFM by traverse if practical. If not practical, the sum of the outlets may be used, or a combination of these procedures. For specific systems, such as ones with diversity, see the AABC *National Standards*.
 - d. Suction and discharge static pressure of each fan, as applicable.
 - e. Outside air, return air and total CFM.
 - f. Actual operating current, voltage and brake horsepower of each fan motor.
 - g. Final RPM of each fan.
 - h. Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
 - i. Belt size and quantity.
 - j. Static pressure controls' final operating set points.
 - 5. Heating and cooling-coil test forms: Record the following items on each test form:
 - a. Manufacturer.
 - b. All design and manufacturers' rated data.
 - c. Rated and actual water pressure drop through each coil and related GPM.
 - d. Rated and actual static pressure drop across each coil.
 - e. Entering and leaving water temperatures.

- f. Wet-bulb and dry-bulb temperatures entering and leaving each cooling coil; dry-bulb temperatures entering and leaving each heating coil.
- 6. Electric Heating Coil/Duct Heater test forms: Test and record the following on each electricheating-coil test form:
 - a. Manufacturer and model number.
 - b. All design and manufacturer rated data.
 - c. Actual operating current and voltage.
 - d. Coil location and identification number.
- 7. Test and balance drawings: Include the following:
 - a. All air devices: Indicate terminal unit as air handler served from design airflow, actual airflow, neck size and air device type.
 - b. Air Handlers: Indicate mark, design supply airflow, actual supply airflow, design return airflow, actual return airflow, outside air design airflow and outside air actual airflow.
 - c. Fans: Indicate mark, design airflow and actual airflow.

1.9 FINAL ACCEPTANCE:

- A. Before Certificate of Final Payment is issued the TABA shall recheck, in the presence of the Owner's representative, Architect and Engineer, specific and random selections of data recorded in the certified test and balance report.
- B. Points and areas for recheck shall be selected by the Owner's representative, Architect and Engineer.
- C. Measurements and test procedures shall be the same as the original test and balance.
- D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.
- E. If random tests demonstrate a measured flow deviation of 10 percent or more from that recorded in the certified test and balance report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified test and balance report submitted, and a new inspection test made, all at no additional cost to the Owner.

END OF SECTION

SECTION 23 80 00

CONVENTIONAL AUTOMATIC CONTROLS

PART 1 - GENERAL

1.1 SCOPE:

A. Section 23 05 00 – "General Provisions – HVAC" shall apply to and become part of this Section.

1.2 CONTROL SYSTEMS:

- A. Furnish and install controls required to supplement BAS System (control wiring, time clock, etc.)
- B. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three years: Honeywell, Johnson, Invensys, Trane, York, Carrier or ALC.
- C. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the control manufacturer.
- D. Include the services of a full time control technician for calibrating and adjusting controls for the first 14 working days after Owner has occupied building.
- E. Before installation, submit for approval 5 copies of complete power and control wiring and piping diagrams and list of control panel locations by room name and number. Hang a photostatic copy of the "as built" diagram, framed behind glass, in each equipment room. Provide one set of reproducible sepias of "as built" control diagrams at completion of project for the Owner's use.
- F. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (Black on white).
- G. Permanently identify control devices, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink.

1.3 CONTROL WIRING:

- A. Include all control and interlock wiring and power wiring for control panel in this Section. Install all control and interlock wiring in EMT. EMT and EMT fittings shall comply with the provisions of Electrical Work.
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls and partitions.
- C. Wire all devices individually to terminal strips in control panels.

D. Furnish necessary relays and auxiliary contactors and other accessories required. Provide interlock relays per N.E.C. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters and Motor Control Centers specified in Electrical Work.

1.4 CONTROL DEVICES:

- A. Room Thermostats: 7-day programmable thermostat with LCD Touch Screen display. ± 1.4°F temperature accuracy from 50°F to 90°F, ± 3% RH humidity accuracy from 20% RH to 80 % RH. Thermostat covers: high impact plastic. Mount at 4'-0" above finished floor in accordance with ADA. Provide remote sensors where specified.
- B. Smoke detectors shall be ionization detectors which detect products of combustion. Furnish, wire, and install smoke detectors under this Section. Provide smoke detectors compatible with fire alarm system specified under electrical Work and equip them with contacts for connection to fire alarm system.
- C. Program Clocks: 7 day electronic, automatically recharged battery operated quartz clock with number of channels required for control sequence, each channel individually programmable. Provide hand-off-auto switch for each channel. (Multiple clocks may be used to obtain required number of channels.) All clocks mounted in a flush control panel as specified. Tork or equal.
- D. Capillary Supports: securely support all duct-mounted and casing-mounted thermostat capillaries using factory fabricated copper bulb supports.
- E. Provide stand-offs for control devices mounted on externally insulated ducts and equipment.
- F. Anchor all items mounted on gypsum board (dry-wall) using toggle bolts or moly bolts, not expansion shields.

1.5 CONTROL PANELS:

- A. Local Control Panels: construct of galvanized steel with baked enamel finish or aluminum-plywood-aluminum fronts and backs and extruded tops, bottoms, and ends. All panels shall have piano hinges and key locking latches (key panels alike). Permanently label instruments located in panels consistent with labeling on control diagram. Cement photostat of approved diagram inside each panel cover. (Include Local-Remote switching for control point adjusters on face of each panel.)
- B. Bottom of control panels shall be located not less than 2-1/2 feet above floor and top not more than 6 feet above the floor.

END OF SECTION

SECTION 23 81 00

BUILDING AUTOMATION SYSTEM (BAS)

PART 1 - GENERAL:

1.1 **PROVISIONS OF DIVISION 23**:

A. Section 23 05 00 - "General Provisions - HVAC" shall apply to and become part of this Section.

1.2 **PROVISIONS OF DIVISION 26**:

A. "General Provisions, Electrical" shall apply to this Section.

1.3 SYSTEM DESCRIPTION:

- A. Provide a building automation system (BAS) consisting of a network of distributed direct digital control processors (DCP) bus connected to a central computer. DCP's shall be microprocessor based and strategically located at data concentration points or in close proximity to the end devices to be monitored and/or controlled. The DCP's shall include stand alone capability of direct digital control with integrated energy management programs including duty cycling, demand, optimum start and analog load reset.
- B. The central computer (CC) shall include an operator's console with display, keyboard and printer. Central software shall include historical data storage, logging and retrieval, upline and downline loading of stored DCP programs, CC and DCP programming software, data logging of analog and digital values and color dynamic graphic software (mouse driven). Alarms and logical groups shall have alphanumeric points and group descriptors.
- C. Provide all sensors, actuators, transducers, DCP's and central equipment to meet functional description.
- D. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three years: Honeywell, Johnson, Invensys, Trane, York, Carrier or ALC.
- E. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the BAS manufacturer.
- F. Use standard components, regularly manufactured and not custom designed for project. Use systems and components proven in use.
- G. System shall be modular, permitting expansion by adding hardware and software without changes in communication or processing equipment.

1.4 WORK REQUIRED:

- A. All engineering design, labor, materials, equipment and services necessary for and reasonably incidental to proper completion of BAS work as shown or herein specified (excepting only work or materials specified or noted as being done or furnished by others), consisting in general of the following, complete and ready for operation.
 - 1. Central Control (CC)
 - 2. Distributed Control Panels (DCP)
 - 3. Software packages
 - 4. Remote control, alarm and sensing devices
 - 5. Fire alarm system interconnects
 - 6. Interface with Power Company meter.
 - 7. Complete wiring network interconnecting all parts of the system
 - 8. Instruction of Owner's operating personnel
 - 9. Service contract

1.5 SUBMITTALS:

- A. Within 30 days of notice to proceed and prior to installation of any equipment, the BAS contractor shall provide 6 copies of submittals for approval. Submittals shall include:
 - 1. A complete system block diagram showing all computers, peripherals, power connections and source, plan of equipment in main control room, trunk wiring links, DCP's and location, and a listing of all points and systems connected to each DCP.
 - 2. Complete operating sequences for all programs provided for HVAC equipment,
 - 3. Specification data sheets for each piece of central and remote hardware, for software application package and for central programs and system services software.
 - 4. Proposed site-unique menu tree showing the full English descriptor proposed for each logical system and the full English description of each logical data point within each system.
 - 5. Menu map of all definition process menu paths showing all elements of menu prompts specified for system definition and user applications.
 - 6. Samples of all specified reports, logs, and printouts showing compliance with all requirements for English code-free outputs.
 - 7. Locations of all control panels by room name and number.

- 8. Thirty days after approval of all above submittal data, submit typed copies of all system control sequences.
- B. Before installing any controls for variable air volume terminals or powered induction units, pipe up, mount reheat coil control valve and test one air terminal of each type used on the project to verify that controls work properly. Certify that the controls operate in accordance with the specified sequence.

1.6 ACCEPTANCE PROCEDURES:

- A. Upon completion, the contractor shall conduct a complete functional test of the system for the owner, architect, and engineer. Contractor shall simulate power failure recovery, and stand alone operation capability on communication loss with Central Control.
- B. Provide 3 full sets of as-built drawings, complete operating manuals and hardware and software documentation.

1.7 WARRANTY SERVICE:

- A. All components, software, parts and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for one year from acceptance date.
- B. Labor to trouble shoot, repair or replace system components shall be furnished at no charge to the owner during the warranty period.

1.8 MAINTENANCE:

- A. The BAS manufacturer shall have a local branch office within 100 miles of the installation staffed with trained, full-time employees capable of performing testing, inspection, repair and maintenance services for the life of the system.
- B. The meantime to repair once the BAS manufacturer's service representative is at the job site with the required parts shall not exceed two hours.

1.9 SYSTEM COMMISSIONING:

- A. The Contractor shall completely checkout, calibrate and test all hardware and software to insure that the system performs in accordance with the approved sequences of operation submitted.
- B. Include the services of a full time control technician for calibrating and adjusting controls for the first 10 working days after Owner has occupied building.
- C. Provide assistance to the Test and Balance Contractor during his review and testing of the Control Systems.

1.10 OPERATOR TRAINING:

A. Contractor shall provide a minimum of two full day's instruction for the owner's operating personnel on system operation and routine maintenance procedures. The BAS manufacturer shall also provide four additional days of on-site instruction and assistance to the owner during the warranty period on a call basis. The owner shall schedule these days at least one week in advance and for intervals of no less than eight hours at a time. The four days are exclusive of necessary travel time. These sessions shall encompass all areas of the system as requested by the owner including troubleshooting, diagnostics and all levels of operation and software definition.

PART 2 - EQUIPMENT:

2.1 GENERAL:

- A. System components requiring line voltage inputs shall be designed and tested to operate satisfactorily and without damage at 10% above and 15% below nominal rated input voltage.
- B. All transmission bus connected devices shall be such that loss of any single device shall not disrupt or interfere with communication to other devices on the bus. Loss of communication with the central control and command station shall not cause any DCP to halt operation or to cease to perform its intended function (i.e., each DCP shall continue to operate on a stand alone basis).
- C. After power failure and upon a power restoration, the system shall provide automatic sequential restart of equipment based on current program time and program requirements without operator intervention.

2.2 CENTRAL CONTROL:

- A. Central control shall include a computer, monitor, wireless keyboard and mouse, printer and software.
- B. Computer shall be PC compatible with not less than 512 gigabyte solid state hard drive, 48X 16XDVD+/-RW/48X CDROM, 12 GB RAM, 3.0 GHZ microprocessor, 1 GB HD Video Card, minimum two HDMI outputs.
- C. Monitor shall be 24" LED color monitor with minimum 1920 x 1080 resolution and HDMI input.
- D. Printer: 8-1/2" x 11" color laserjet.
- E. Central control equipment shall be equipped with a power supply with filtered AC input, surge protection, battery backup and shall be installed on-site at a location directed by Owner.

2.3 DISTRIBUTED DIRECT DIGITAL CONTROL PROCESSORS (DCP'S):

A. To prevent a single-failure catastrophe, multiple direct digital controllers shall be provided. Failure of any single controller shall have no effect on other controllers.

- B. Direct digital controllers shall be microprocessor-based with all hardware, software, and communications interfaces. DCP's shall be capable of stand-alone operation, and incorporation into larger systems. The controllers shall be either 16 bit, or multiple 8 bit microprocessors configured so that input-output processing and operator command processing may be offloaded from the control processing. If the DCP's use digital communication to remote "slave" gathering panels, all such communication circuits extending outside the DCP shall utilize dual (redundant) bus cabling, be supervised, and provided with an auto-failover feature.
- C. The controller shall be factory mounted and wired in a steel enclosure complete with all relays, digital to analog converters, and terminal strips. Controllers shall be expandable to 15% points of each type (analog and digital input and output) in excess of those actually required for this project.
- D. The controller shall operate within the following limits:
 - 1. Temperature 33 to 122°F.
 - 2. Humidity 0 to 95% RH (non-condensing)
 - 3. Voltage 24 VAC + 10% to -15% 50 or 60 HZ.
- E. The controllers shall withstand storage conditions as follows:
 - 1. Temperature -4 to 176°F.
 - 2. Humidity 0 to 95% RH (non-condensing)
- F. Local Diagnostics and Programming:
 - 1. Each DCP shall be equipped to provide local diagnostics and adjustments either through a built-in digital display and keyboard to show such information as time and date, analog variables, binary conditions, system operation modes, critical alarms and operator definable functions to allow the operator to analyze and adjust the system being controlled or through a portable hand held operator's terminal. Provide one operator's terminal for job.
 - 2. Adjustments shall include but not be limited to proportional gain, integral rate, velocity and acceleration constants associated with incremental control and on/off values of two-position control.
 - 3. The DCP shall be fully field programmable with the following built-in functions:
 - a. All closed loop control functions (P, PI, PID, incremental, floating, two-position, etc.)
 - b. All energy management functions
- G. The system shall utilize PROM and RAM memory. All DDC algorithms and parameters shall be RAM based for ready access for modification and adjustment. RAM memory shall be provided with 100 hours battery backup minimum.
- H. The controller software shall include a complete operating system, standard energy management application packages, standard control algorithm application packages, and an owner/user custom control and calculation application package complete with interpreter. Complete user documentation modules shall be provided.

- I. DCP's shall be capable of being programmed to utilize stored default values for assured fail safe operation of critical processes. Default values shall be invoked upon sensor failure or, if the primary value is normally provided by the CC or another DCP, by loss of bus communication. Individual application software packages shall also be structured to assume a fail safe condition upon loss of input sensors. Loss of an input sensor shall result in output of a "sensor failed" message at the central control and command station.
- J. The operating system software shall be PROM resident and operate independently of any central computer. The operating system shall control communications between the central terminal and the controllers and I/0 modules, provide alarm monitoring and reporting, provide control application packages, and contain built-in diagnostic routines.
- K. The controller shall have memory error checking. Upon detection of a memory error, the CPU shall correct the error or halt to prevent erroneous operation. All "halts" shall report as an alarm at the central control terminal.
- L. After a power failure and upon a power restoration, the system shall provide automatic sequential restart of equipment based on current program time and program requirements without operator invention.
- M. Controllers shall accept industrial platinum and resistance sensors. Each output point shall be provided with an L.E.D. which shall indicate status of digital outputs and value (via variable intensity) of analog outputs. Processor software shall allow for scaling and for calibration of sensor lead length variations to insure display accuracies.

2.4 SOFTWARE:

- A. Software shall include the following:
 - 1. System access limitation with 3 levels of access (operation only; operation plus programming; operation, operation plus programming; assigning individual passwords and authorization levels).
 - 2. Psychrometric routines.
 - 3. Alarm lockout.
 - 4. Floating alarm limits.
 - 5. Time delay start sequence.
 - 6. Time of day.
 - 7. Optimum start-stop.
 - 8. Smoke control.
 - 9. Air economizer initiation.
 - 10. Air tracking.
 - 11. DDC programs as required.

- 12. Event initiated programs.
- 13. DCP programming (from CC and DCP).
- 14. Data logging.
- 15. Status logging (all points).

2.5 TRANSMISSION NETWORK:

- A. Communications between controllers shall have a system line capability of at least 3300 feet, or systems shall be equipped with modems.
- B. Transmission line shall be electrically isolated from the DCP's and operator's terminal by optical couplers at each interface to prevent any voltages in the transmission lines from damaging any of the electronic circuits.

2.6 CONTROL WIRING:

- A. Include all control and interlock wiring and power wiring for DCP's and control panel in this Section. Install in conduit in accordance with provisions of Electrical Work.
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls and partitions.
- C. Wire all devices individually to terminal strips in control panels.
- D. Furnish necessary relays and auxiliary contacts and other accessories required. Provide interlock relays per N.E.C. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters and Motor Control Centers specified in Electrical Work.

2.7 CONTROL DEVICES:

- A. Room temperature sensors: Accuracy $\pm 0.3^{\circ}$ F, case to match case of pneumatic room thermostats.
- B. Single point temperature sensor duct accuracy <u>+</u> 0.3°F (accuracy for sensors serving BTU meters <u>+</u> 0.1°F), stainless steel wells for pipe mounted sensor, bulb supports for duct mounted sensor.
- C. Remote bulb thermostats and temperature transmitters:
 - Unless otherwise shown use averaging elements not less than 8 feet long for duct or casing cross sections up to 24 square feet face area and elements not less than 17 feet long for sections over 24 square feet face area, accuracy: <u>+</u> 0.3°F.
- 2. At contractor's option, average temperature measurements for mixed air or coil discharge air may be made by an array of paralleled Type J or Type T thermocouples. Individual thermocouples shall be located not more than 12" apart with the bottom row 3" above the bottom of the coil. In no case shall less than 6 thermocouples be used. Thermocouples: solid 24 gauge wire, teflon insulated. Thermocouple extension wire 16 gauge, solid, twisted, shielded PVC or teflon insulated. Thermocouples shall be mounted using an EMT grid.
- D. Humidity Sensors: Accuracy <u>+</u> 1% over 30 to 80% RH range. Case to match case of pneumatic room thermostat.
- E. Outdoor and Duct Humidity Sensors: Accuracy <u>+</u> 1% over 30 to 80% RH range.
- F. Freezestats: Manual reset, pneumatic not permitted. Locate freezestat bulbs between preheat and chilled water coils in units with chilled water coils and downstream from DX coils in units with DX coils.
- G. Firestats: Single pole double throw, electric, manual reset, pneumatic not permitted. Firestats shown to be connected to the fire alarm system: compatible with fire alarm system, furnished and installed under Controls, wired under Electrical Work.
- H. Flow Switches: Vaporproof enclosures, McDonnell & Miller. Pneumatic not permitted.
- I. Valve & Damper Operators: Of sufficient power to close/open valves and dampers under operating conditions. Electric valve and damper motors shall have oil immersed gear trains and spring return to normal position.
- J. Static pressure measurement stations shall be bi-directional pressure transducers providing 0 to 5 VDC or 4-20 mA proportional output. Bi-directional range shall be 0 to <u>+</u> 0.1 to 0 to <u>+</u> 50 in. W.C. Minimum <u>+</u> 0.5% full scale accuracy. Setra DPT264 or equal.
- K. Current Transformers: Comply with ISA 50.00.01, current-sensing fixed or split-core transformers with self-powered transmitter, adjustable trip and suitable for 175 percent of rated motor current.
- L. Velocity Pressure Transducers 0 to 5 volts DC, accuracy <u>+</u> 2% full scale, return air range, (0 to 0.25" WG), supply air range (0 to 0.5") (0 to 1.0"), Setra or equal.
- M. Wells: install pipe line mounted control and indicating devices in stainless steel or brass thermometer wells.
- N. Capillary Supports: securely support all duct-mounted and casing-mounted thermostat capillaries using factory fabricated copper bulb supports.
- O. Provide stand-offs for control devices mounted on externally insulated ducts and equipment.
- P. Anchor all items mounted on gypsum board (dry-wall) using toggle bolts or moly bolts, not expansion shields.
- Q. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (White on black).
- R. Permanently identify control devices and room thermostats, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink. Mark room thermostats and room temperature sensors on inside of covers.

S. Automatic Dampers:

- 1. Provide and install automatic dampers as shown on plans, scheduled, or as required. Coordinate size, quantity and locations of automatic dampers with automatic control work as required. Dampers shall be factory fabricated with extruded aluminum blades and frames.
- 2. Damper frames shall be 5" x 1" x .125" (minimum thickness) extruded aluminum hat channel with hat shaped mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity or integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.
- 3. Damper blades shall be airfoil type extruded aluminum with metal blade to metal blade overlap. Each blade shall be maximum 6" depth with integral structural reinforcing tube running full length. Minimum thickness of blade shall be 0.070". Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening. Blade orientation is horizontal. Blade operation is parallel or opposed. Blades shall be contained within the damper frame.
- 4. Blade edge seals shall be flexible and suitable for -72°F to +275°F mechanically locked in extruded blade slots yet easily replaceable in field. Jamb seals shall be flexible stainless steel, compression type to prevent leakage between the end of the blade and the damper frame. Use of blade end to overlap the frame for jamb seal is not acceptable. Adhesive or clip-on type blade or jamb seals are not acceptable.
- 5. Bearings shall be non-corrosive molded synthetic. Axles shall be 1/2" plated steel hexagonal shaped and to provide positive locking connection to blade. Linkage shall be concealed out of airstream, within frame to reduce pressure drop, noise and maintenance.
- 6. Provide and install Electric, 24 or 120V AC, spring return, 2-position or modulating damper actuator(s) as specified in controls specification sections or as indicated on drawings. Actuator(s) shall be sized as required to sufficiently open/close dampers under operating conditions. Multiple actuators shall be provided as required.
- 7. Install dampers in accordance with manufacturer's installation instructions and requirements. Install dampers square and free from racking.
- 8. Dampers must be accessible to allow inspection, adjustment, and replacement of components. Provide and install access doors as specified and required.
- 9. Provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.
- 10. Submittal shall include leakage, maximum airflow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage. Damper shall meet the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1" of static pressure and shall be AMCA licensed as Class 1A.
- 11. Saw-mark ends of damper rods parallel to blades.

- 12. Rectangular dampers shall be Ruskin Model CD50, Greenheck VCD-43, or preapproved equivalent.
- 13. Round dampers shall be Ruskin Model CDRS25, Greenheck VCDR-53, or preapproved equivalent.

2.8 CONTROL DEVICE APPLICATIONS:

- A. Pump Status: Flow switches.
- B. Fan Status: Differential static pressure switches.

PART 3 - CONTROL SEQUENCES:

3.1 GENERAL:

- A. Control diagrams on drawings are intended to indicate, in general, control arrangements. Provide all instruments, relays, operators, switches, etc. required to accomplish control sequences whether or not such devices are actually shown on control diagrams.
- B. As shown on drawings.

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GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 QUALITY ASSURANCE

A. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- 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. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install barecopper conductor, sized per drawings.
 - 1. Bury at least 24 inches (600 mm) below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated

equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
- G. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 - 5. Substations and Pad-Mounted Equipment: 5 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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 the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 **PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Nonmetal wireways and auxiliary gutters.
 - 5. Surface raceways.
 - 6. Boxes, enclosures, and cabinets.
 - 7. Handholes and boxes for exterior underground cabling.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. IMC: Comply with ANSI C80.6 and UL 1242.
- D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. FMC: Comply with UL 1; zinc-coated steel.
- G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: compression.
 - 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Rigid HDPE: Comply with UL 651A.
- F. RTRC: Comply with UL 1684A and NEMA TC 14.
- G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Wireway Covers: Hinged type unless otherwise indicated.
- D. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Metal Floor Boxes:
 - 1. Material: Cast metal.
 - 2. Type: Fully adjustable.
 - 3. Shape: Rectangular.
 - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K. Gangable boxes are prohibited.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Quazite: Hubbell Power System, Inc.
 - 2. Standard: Comply with SCTE 77.
 - 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 - 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 - 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: IMC.
 - 3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 6. Damp or Wet Locations: IMC.
 - 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from ENT to IMC before rising above floor.
- J. Raceways Below Slabs:
 - 1. Change from ENT to IMC before rising above floor.
- K. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

- S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- V. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for meter of length of straight run per deg C) of length of straight run per deg C) of temperature change for meter of length of straight run per deg C) of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
- Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

- Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- AA. Locate boxes so that cover or plate will not span different building finishes.
- BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- DD. Set metal floor boxes level and flush with finished floor surface.
- EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches (150 mm) in nominal diameter.
 - 2. Install backfill.
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
 - 4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
 - 5. Underground Warning Tape: Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths

to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 **PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 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.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. 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 annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 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.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [steel] [cast-iron] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- 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.

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.3 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on white background.
 - 2. Legend: Indicate voltage and system or service type.
- C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

2.4 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
 - 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.6 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Baked-Enamel Warning Signs:

- 1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
- 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
- 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.8 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self-locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F ((23 deg C)), According to ASTM D 638: 7000 psi (48.2 MPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 - 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
- J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot (3-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.

- 3) Phase C: Blue.
- c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Limit use of underground-line warning tape to direct-buried cables.
 - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
- I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch-

(38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
- 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchgear.
 - e. Switchboards.
 - f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - g. Substations.
 - h. Emergency system boxes and enclosures.
 - i. Motor-control centers.
 - j. Enclosed switches.
 - k. Enclosed circuit breakers.
 - I. Enclosed controllers.
 - m. Contactors.
 - n. Battery-inverter units.
 - o. Power-generating units.
 - p. Monitoring and control equipment.

LIGHTING CONTROL DEVICES

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. Section Includes:
 - 1. Time switches.
 - 2. Photoelectric switches.
 - 3. Indoor occupancy sensors.
 - 4. Lighting contactors.
 - 5. Emergency shunt relays.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Lutron
 - 2. Intermatic, Inc.
 - 3. Invensys Controls.
 - 4. Leviton Mfg. Company Inc.

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2.2 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Intelligent lighting controls.
 - 2. Cooper Industries, Inc.
 - 3. Leviton Mfg. Company Inc.
 - 4. Lightolier Controls.
 - 5. Lutron Electronics Co., Inc.
 - 6. NSi Industries LLC; TORK Products.
 - 7. RAB Lighting.
 - 8. Sensor Switch, Inc.
 - 9. Square D; a brand of Schneider Electric.
 - 10. Watt Stopper.
- C. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 - 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 - 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 - 7. Bypass Switch: Override the "on" function in case of sensor failure.
 - 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 - 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Allen-Bradley/Rockwell Automation.
 - 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
 - 3. Eaton Corporation.
 - 4. General Electric Company; GE Consumer & Industrial Electrical Distribution; Total Lighting Control.
 - 5. Square D; a brand of Schneider Electric.
- C. Description: Electrically operated and mechanically held, combination-type lighting contactors with fusible switch, complying with NEMA ICS 2 and UL 508.
 - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 - 3. Enclosure: Comply with NEMA 250.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
SECTION 26 2416 PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
- B. SVR: Suppressed voltage rating.
- C. TVSS: Transient voltage surge suppressor.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard 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 bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

- 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 NEMA PB 1.
- E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panelboards for installation according to NECA 407.

1.6 **PROJECT CONDITIONS**

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding [23 deg F (minus 5 deg C)] to plus 104 deg F (plus 40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: As shown on schedules.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
 - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Phase, Neutral, and Ground Buses:

- 1. Material: Hard-drawn copper, 98 percent conductivity.
- 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- C. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Compression type.
 - 3. Ground Lugs and Bus-Configured Terminators: Compression type.
 - 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 - 6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- D. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Branch Overcurrent Protective Devices for Circuit-Breakers: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- E. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, fieldadjustable trip setting.
 - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards 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 INSTALLATION

- A. Install panelboards and accessories according to NECA 407.
- B. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- C. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.

- D. Install filler plates in unused spaces.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 0553 "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0570 "Electrical System Study."

3.6 **PROTECTION**

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

SECTION 26 2726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
 - 2. USB charger devices.
 - 3. GFCI receptacles.
 - 4. Toggle switches.
 - 5. Decorator-style convenience.
 - 6. Wall plates.
 - 7. Floor service outlets.
 - 8. Poke-through assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
- B. Controlled Duplex Convenience Receptacles: 125V, 20A: Permanently marked as controlled. Equal to Leviton 5362-S2T (color by architect) comply with NEMA WD 1, NEMA WD 6 configurations 5-20R, UL 498, and FS W-C-596.

2.3 USB CHARGER DEVICES

- A. Tamper-Resistant, USB Charger Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.
 - 1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
 - 2. USB Receptacles: Single, Type A.
 - 3. Line Voltage Receptacles: Single, two pole, three wire, and self-grounding.

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. 125 V, 20 A, straight blade, non-feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.5 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

2.6 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weatherresistant, die-cast aluminum with lockable cover.

2.7 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.8 POKE-THROUGH ASSEMBLIES

- A. Description:
 - 1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
 - 2. Comply with UL 514 scrub water exclusion requirements.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables.

2.9 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: As selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

- 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
- 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
- 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
- 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
- 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
- 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
- 8. Tighten unused terminal screws on the device.
- 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold devicemounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
- D. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.

- 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
- 3. Ground Impedance: Values of up to 2 ohms are acceptable.
- 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
- 5. Using the test plug, verify that the device and its outlet box are securely mounted.
- 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- E. Wiring device will be considered defective if it does not pass tests and inspections.

SECTION 26 2813

FUSES

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 the following:
 - 1. Cartridge fuses rated 600 V and less for use in switches.

1.3 SUBMITTALS

- A. Product Data: For each fuse type indicated.
- B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. 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.
- B. Comply with NEMA FU 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussman, Inc.
 - 2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.2 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Enclosures.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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 NFPA 70.

1.4 **PROJECT CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).

2. Altitude: Not exceeding 6600 feet (2010 m).

1.5 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0570 "Electrical System Study."

SECTION 26 5100

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Energy-efficiency data.
 - 4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
 - 5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
 - a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom lighting fixtures. 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.
- C. Installation instructions.

1.3 QUALITY ASSURANCE

- 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. Comply with NFPA 70.
- C. All Fixtures to have A U.L. label.

1.4 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Factory-Applied Labels: Comply with UL 1598. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.3 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Integral Self-Test: Factory-installed electronic device automatically initiates coderequired test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.4 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
 - 7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 26 0529 "Hangers and Supports for Electrical Systems" for channel- and angleiron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).
- F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures:
 - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

- C. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by manufacturer. Verify, with manufacturers, maximum distance between driver and luminaire.
- D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
 - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
 - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
- E. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
- F. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
 - 1. Adjust aimable luminaires in the presence of Architect.

SECTION 26 5600 EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior luminaires with lamps and ballasts.
 - 2. Poles and accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
 - 2. Details of attaching luminaires and accessories.
 - 3. Details of installation and construction.
 - 4. Luminaire materials.
 - 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
 - 6. Ballasts, including energy-efficiency data.
 - 7. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
 - 8. Materials, dimensions, and finishes of poles.
 - 9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
 - 10. Anchor bolts for poles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- 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. All fixtures to have U.L. labels.
- C. Comply with IEEE C2, "National Electrical Safety Code."
- D. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- K. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

- L. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's full range.
- M. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp and ballast characteristics:
 - a. "USES ONLY" and include specific lamp type.
 - b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
 - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
 - d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
 - e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
 - f. CCT and CRI for all luminaires.

2.3 FLUORESCENT BALLASTS AND LAMPS

- A. Ballasts for Low-Temperature Environments:
 - 1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
 - 2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.
- B. Ballast Characteristics:
 - 1. Power Factor: 90 percent, minimum.
 - 2. Total Harmonic Distortion Rating: Less than 10 percent.
 - 3. Electromagnetic Ballasts: Comply with ANSI C82.1, energy-saving, high power factor, Class P, automatic-reset thermal protection.
 - 4. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
 - 5. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
- C. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures 0 deg F (minus 18 deg C) and higher.

2.4 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

- 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
- 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
 - 3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.
- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange.

2.5 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.
 - 1. Shape: as indicated on schedules.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with stainless-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 - 3. Match pole material and finish.
- C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- D. Steps: Fixed steel, with nonslip treads, positioned for 15-inch (381-mm) vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet (3 m) above finished grade.
- E. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 26 0526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- F. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

- G. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
 - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
 - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's full range.

2.6 DECORATIVE POLES

- A. Pole Material:
 - 1. Cast concrete or spun concrete.
- B. Mounting Provisions:
 - 1. Embedded.
- C. Fixture Brackets:
 - 1. Cast ductile iron.
- D. Pole Finish: as selected by architect.

2.7 PRESTRESSED CONCRETE POLES

- A. Poles: Manufactured by centrifugal spin-casting process.
 - 1. Shape: as selected by architect.
 - 2. Mounting Provisions: Embedded.
 - 3. Finishing: Capped at top and plugged at bottom. Seat each steel reinforcing strand with epoxy adhesive.
 - 4. Grounding: Continuous copper ground wire cast into pole. Terminate at top of pole and attach to 24-inch (610-mm) lightning rod.
- B. Cure with wet steam and age for a minimum of 15 days before installation.
- C. Fabricate poles with a hard, nonporous surface that is resistant to water, frost, and road and soil chemicals and that has a maximum water-absorption rate of 3 percent.
- D. Cast aluminum nameplate into pole wall at approximately 5 feet (1.5 m) above ground line, listing name of manufacturer, Project identifier, overall height, and approximate weight.
- E. Pole Brackets: Comply with ANSI C136.13.

- F. Finish Color: Provided by color material complying with ASTM C 979, uniformly impregnated throughout the pole concrete. Color material shall provide a uniform, stable, permanent color and be as follows:
 - 1. Inert, and carbon free.
 - 2. Unaffected by environmental conditions and contaminants including, but not limited to, UV solar radiation, salts, and alkalis.
- G. Finish Texture: as selected by architect.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
- C. Adjust luminaires that require field adjustment or aiming.

3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
 - 1. Fire Hydrants and Storm Drainage Piping: 60 inches (1520 mm).
 - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet (3 m).
 - 3. Trees: 15 feet (5 m) from tree trunk.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.
- D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.
 - 1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 - 2. Install base covers unless otherwise indicated.
 - 3. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
 - 1. Dig holes large enough to permit use of tampers in the full depth of hole.
 - 2. Backfill in 6-inch (150-mm) layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- F. Raise and set poles using web fabric slings (not chain or cable).

3.3 BOLLARD LUMINAIRE INSTALLATION

- A. Align units for optimum directional alignment of light distribution.
- B. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.

3.4 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth.

3.5 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.6 GROUNDING

- A. Ground metal poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole.
 - 2. Install grounding conductor and conductor protector.
 - 3. Ground metallic components of pole accessories and foundations.

3.7 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 - 1. Verify operation of photoelectric controls.

SECTION 27 0528

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

- 1. Metal conduits and fittings.
- 2. Nonmetallic conduits and fittings.
- 3. Optical-fiber-cable pathways and fittings.
- 4. Metal wireways and auxiliary gutters.
- 5. Nonmetallic wireways and auxiliary gutters.
- 6. Metallic surface pathways.
- 7. Nonmetallic surface pathways.
- 8. Hooks.
- 9. Boxes, enclosures, and cabinets.
- 10. Polymer-concrete handholes and boxes for exterior underground cabling.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

- A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.
- B. General Requirements for Metal Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
 - 2. Comply with TIA-569-D.
- C. EMT: Comply with ANSI C80.3 and UL 797.
- D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.02 NONMETALLIC CONDUITS AND FITTINGS

- A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.
- B. General Requirements for Nonmetallic Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 2. Comply with TIA-569-D.

- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Rigid HDPE: Comply with UL 651A.
- E. Continuous HDPE: Comply with UL 651A.
- F. RTRC: Comply with UL 2515A and NEMA TC 14.
 1. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.
- B. General Requirements for Metal Wireways and Auxiliary Gutters:
 - 1. Comply with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 3. Comply with TIA-569-D.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- C. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:
 - 1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 2. Comply with TIA-569-D.
- D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.05 SURFACE METAL PATHWAYS

- A. Description: Galvanized steel with snap-on covers, complying with UL 5.
- B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- C. Comply with TIA-569-D.

2.06 SURFACE NONMETALLIC PATHWAYS:

- A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.
- B. Finish: Texture and color selected by Architect from manufacturer's standard colors.
- C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with TIA-569-D.

2.07 HOOKS

- A. Description: Prefabricated sheet metal cable supports for telecommunications cable.
- B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- C. Comply with TIA-569-D.
- D. Galvanized or stainless steel.
- E. J shape.

2.08 BOXES, ENCLOSURES, AND CABINETS

- A. Description: Enclosures for communications.
- B. General Requirements for Boxes, Enclosures, and Cabinets:
 - 1. Comply with TIA-569-D.
 - 2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
 - 3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
 - 4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
 - 5. Gangable boxes are allowed.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Metal Floor Boxes:
 - 1. Material: Cast metal or sheet metal.
 - 2. Type: Fully adjustable.
 - 3. Shape: Rectangular.
 - 4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
 - 1. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures:
 - a. Material: Plastic.
 - b. Retain first subparagraph below to require radio-frequency-resistant paint.
 - c. Finished inside with radio-frequency-resistant paint.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- K. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.01 PATHWAY APPLICATION

- A. Minimum Pathway Size: 3/4-inch (21-mm) trade size for copper and aluminum cables, and 1 inch (25 mm) for optical-fiber cables.
- B. Pathway Fittings: Compatible with pathways and suitable for use and location.

- C. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- D. Install surface pathways only where indicated on Drawings.
- E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 INSTALLATION

- A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-D.
 - 4. NECA 101
 - 5. NECA 102.
 - 6. NECA 105.
 - 7. NECA 111.
- B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- D. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems" for hangers and supports.
- E. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- F. Complete pathway installation before starting conductor installation.
- G. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.
- H. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- I. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- J. Pathways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
 - 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
 - 3. Arrange pathways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.

- 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- 5. Some authorities having jurisdiction may not permit nonmetallic tubing in fire-rated slabs in subparagraph below.
- 6. Change from nonmetallic conduit and fittings to GRC or IMC and fittings before rising above floor.
- K. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- M. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.
- O. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- P. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.
- Q. Surface Pathways:
 - 1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
 - 2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
 - 3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- R. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
 - 1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
 - 2. 1-Inch (25-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

- S. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.
- T. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- V. Expansion-Joint Fittings:
 - Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC[and EMT] that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet (30 m).
 - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
 - 3. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- W. Hooks:
 - 1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
 - 2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
 - 3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
 - 4. Space hooks no more than 5 feet (1.5 m) o.c.
 - 5. Provide a hook at each change in direction.
- X. Mount boxes at heights indicated on Drawings. Install boxes with height measured to center of box unless otherwise indicated.
- Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

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- Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- BB. Set metal floor boxes level and flush with finished floor surface.
- CC. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit. Install backfill.
 - 2. After installing conduit, backfill and compact.
 - 3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete around conduit for a minimum of 12 inches (300 mm) on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
 - 4. Underground Warning Tape: Comply with requirements in Section 270553 "Identification for Communications Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.06 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.07 **PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 0529

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Steel slotted support systems for communication raceways.
 - 2. Conduit and cable support devices.
 - 3. Support for conductors in vertical conduit.
 - 4. Structural steel for fabricated supports and restraints.
 - 5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
 - 6. Fabricated metal equipment support assemblies.

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles, with minimum 13/32-inch- (10mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 3. Channel Width: 1-5/8 inches (41 mm).
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel and malleable-iron clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.

2.01 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-C.
 - 4. NECA 101
 - 5. NECA 102.
 - 6. NECA 105.
 - 7. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps, using spring friction action for retention in support channel.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.01 SUPPORT INSTALLATION

A. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

- B. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Use expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- C. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.01 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION

SECTION 27 1513

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

101 SUMMARY

- A. Section Includes:
 - 1. Category 6 twisted pair cable.
 - 2. Twisted pair cable hardware, including plugs and jacks.
 - 3. Cable management system.
 - 4. Grounding provisions for twisted pair cable.
 - 5. Coaxial Cable
 - 6. Pathways
 - 7. Equipment Frames

102 COPPER HORIZONTAL CABLING DESCRIPTION

- A. The Horizontal (workstation) Cabling System shall consist of 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet as shown on the plans. The cables shall be installed from the Work Area Outlet to the Telecommunications Room location as called for and routed to the appropriate rack serving that area and terminated as specified in this document.
- B. A work area is approximately 100 sq. ft. (9.3 sq. m) and includes the components that extend from the equipment outlets to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

103 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Reviewed and stamped by RCDD.
 - 1. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment.
- C. Twisted pair cable testing plan.

104 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.
- B. Product Certificates: For each type of product.
- C. Field quality-control reports.

105 CLOSEOUT SUBMITTALS

A. Maintenance data.

106 QUALITY ASSURANCE

A. BICSI is an industry trade association. See "Communications Copper Horizontal Cabling" Article in the Evaluations for summaries of qualifications for registration. Installer Qualifications: The successful telecommunications contractor shall be a company specializing in communication cabling installation and shall have been in business for a minimum of 5 years under the same name and with the same board of directors/ management Contractor must have successfully completed a minimum of 3 projects of similar size and scope within the last 5 years. At least 30 percent of the copper installation and termination crew must be certified by BICSI and the cable/connectivity manufacturer with a Technicians Level of Training. At least 10 percent of the optical fiber installation and termination crew must be certified by BICSI and the cable/connectivity manufacturer in optical fiber installation and termination practices. The contractor must have an RCDD on staff in responsible charge of the project. Provide all contact information for the RCDD as this will be the point of contact for the project.

- 1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
- 2. Installation Supervision: Installation shall be under the direct supervision of a BICSI certified Commercial Installer, Level 2, who shall be present at all times when work of this Section is performed at Project site.
- 3. Structured cabling contractor shall have on site for final inspection the RCDD who is in responsible charge of the project or the on-site installation supervisor.
- 4. Testing supervisor shall be currently certified by BICSI as an RCDD and shall be on-site

107 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

201 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.
- D. 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 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
 - 1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway or Type CMP in listed cable routing assembly.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. RoHS compliant.

203 CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.
- B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

- C. Conductors: 100-ohm, 23 AWG solid copper.
- D. Shielding/Screening: Unshielded twisted pairs (UTP).
- E. Cable Rating: Plenum.
- F. Jacket: Blue thermoplastic.

204 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Leviton Manufacturing Co., Inc.
 - 2. Or approved equal.
- C. General Requirements for Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 6 Category 6a.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.
- E. 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. Replaceable connectors.
 - d. 24 or 48 ports.
 - 2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
 - 3. Number of Jacks per Field: One for each four-pair cable indicated.
- F. Patch Cords: Factory-made, four-pair cables in 48-inch (1200-mm) lengths; terminated with an eightposition modular plug at each end.
 - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
- G. 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 twisted pair cable.
 - 2. Standard: Comply with TIA-568-C.2.
 - 3. Marked to indicate transmission performance.
- H. 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 twisted pair cable.
 - 2. Designed to snap-in to a patch panel or faceplate.
 - 3. Standard: Comply with TIA-568-C.2.
 - 4. Marked to indicate transmission performance.
- I. Faceplate:
 - 1. Two port, vertical single gang faceplates designed to mount to single gang wall boxes.
 - 2. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."

- 3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

J. Legend:

- 1. Machine printed, in the field, using adhesive-tape label.
- 2. Snap-in, clear-label covers and machine-printed paper inserts.

205 GROUNDING

- A. Comply with requirements in Section 27 05 26 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-B.

206 PATCH CORDS

- A. Work Area Patch cords: Factory-made, four-pair, category 6 cables in 3-foot, 5 foot, 7 foot, 10 foot and 15 foot lengths; terminated with eight-position modular plug at each end.
- B. Contractor shall provide one each patch cord for each Data and Voice cable terminated in a work area outlet. Patch cord shall be provided in the following lengths:
 - 1. 10% of patch cords provided shall be 3 foot in length.
 - 2. 20% of patch cords provided shall be 5 foot in length.
 - 3. 30% of patch cords provided shall be 7 foot in length.
 - 4. 30% of patch cords provided shall be 10 foot in length.
 - 5. 10% of patch cords provided shall be 15 foot in length.

207 COAXIAL CABLE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Superior Essex
 - 2. Belden Inc
 - 3. CommScope, Inc
- B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
- C. RG-11/U: NFPA 70, Type CATV.
 - 1. No. 14 AWG, solid, copper-covered steel conductor.
 - 2. Gas-injected, foam-PE insulation.
 - 3. Quad shielded with 100 percent aluminum polyester tape and minimum 60 percent aluminum braid
 - 4. Jacketed with sunlight-resistant, black PVC or PE, suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.
- D. RG-6/U: NFPA 70, Type CATV or CM.
 - 1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
 - 2. Quad shielded with 100 percent aluminum-foil shield and minimum 60 percent aluminum braid.
 - 3. Jacketed with black PVC or PE Suitable for indoor installations.

- E. NFPA and UL compliance listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
 - 1. CATV Cable: Type CATV, or CATVP or CATVR.
 - 2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
 - 3. CATV Riser Rated: Type CATVR; or CATVP, CATVR, or CATV, complying with UL 1666.
 - 4. CATV Limited Rating: Type CATVX.

208 PATHWAYS

- A. General Requirements: Comply with TIAIEIA-569-A.
- B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and O-rings.
 - 3. Straps and other devices.

209 EQUIPMENT FRAMES

Α. Equipment racks/cabinets shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Horizontal Wire management shall also be mounted above and below each patch panel and/or piece of equipment on the rack at a ratio of 1 rack unit of horizontal cable management per each rack unit of patching or equipment or 1 rack unit of horizontal cable management per 24 ports of patching or active network equipment (whichever is greater). The rack shall include mounting brackets for cable tray ladder rack cable runway to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management.

PART 3 - EXECUTION

301 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
 Install plenum cable in environmental air spaces, including plenum ceilings.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.
- D. General Requirements for Cabling:
 - 1. Comply with TIA-568-C.1.
 - 2. Comply with BICSI's Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.

- 3. Install 110-style IDC termination hardware unless otherwise indicated.
- 4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- 5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
- 6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
- 7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
- 8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
- 9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
- 10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
- 11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
- 12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
 - 1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.

302 FIRESTOPPING

- A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

303 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-B and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

304 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.
- C. Equipment grounding conductors.
- D. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

305 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for 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 twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

SECTION 28 3111

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

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. Section Includes:

- 1. Fire-alarm control unit.
- 2. Manual fire-alarm boxes.
- 3. System smoke detectors.
- 4. Heat detectors.
- 5. Notification appliances.
- 6. Device guards.
- 7. Magnetic door holders.
- 8. Addressable interface device.
- 9. Digital alarm communicator transmitter.
- 10. Network communications.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. NICET: National Institute for Certification in Engineering Technologies.

1.4 ACTION SUBMITTALS

- A. 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.
- B. Shop Drawings: For fire-alarm system.
 - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - 2. Include plans, elevations, sections, details, and 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 statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification 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. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; 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 required for HVAC unit shutdown on alarm.
 - c. Locate detectors according to manufacturer's written recommendations.
- 12. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
- 13. 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.
- C. General Submittal Requirements:
 - Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified, fire-alarm technician; Level IV minimum.
 - c. Licensed or certified by authorities having jurisdiction.

1.5 CLOSEOUT SUBMITTALS

1

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 - 1. Include the following and deliver copies to authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Record copy of site-specific software.
 - g. Provide "Inspection and Testing Form" according to the "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.
 - h. Manufacturer's required maintenance related to system warranty requirements.
 - i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
- C. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.7 **PROJECT CONDITIONS**

A. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice evacuation.
- B. Automatic sensitivity control of certain smoke detectors.
- C. All components provided shall be listed for use with the selected system.
- D. 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.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Duct smoke detectors.
 - 5. Automatic sprinkler system water flow.
 - 6. Fire-extinguishing system operation.
 - 7. Fire standpipe system.
 - 8. Dry system pressure flow switch.
 - 9. Fire pump running.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances, including voice evacuation notices.
 - 2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
 - 3. Transmit an alarm signal to the 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 heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
- 8. Recall elevators to primary or alternate recall floors.
- 9. Activate elevator power shunt trip.
- 10. Activate emergency lighting control.
- 11. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
 - 1. Valve supervisory switch.
 - 2. Elevator shunt-trip supervision.
 - 3. Fire pump running.
 - 4. Fire-pump loss of power.
 - 5. Fire-pump power phase reversal.
 - 6. Independent fire-detection and -suppression systems.
 - 7. User disabling of zones or individual devices.
 - 8. Loss of communication with any panel on the network.
- D. System trouble signal initiation shall 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 any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
 - 4. Loss of primary power at fire-alarm control unit.
 - 5. Ground or a single break in internal circuits of fire-alarm control unit.
 - 6. Abnormal ac voltage at fire-alarm control unit.
 - 7. Break in standby battery circuitry.
 - 8. Failure of battery charging.
 - 9. Abnormal position of any switch at fire-alarm control unit or annunciator.
 - 10. Voice signal amplifier failure.
- E. System Supervisory Signal Actions:
 - 1. Initiate notification appliances.
 - 2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
 - 3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
 - 4. Transmit system status to building management system.
 - 5. Display system status on graphic annunciator.

2.3 **PERFORMANCE REQUIREMENTS**

2.4 FIRE-ALARM CONTROL UNIT

- A. Manufacturers: Subject to compliance with requirements, provide non proprietary system.
- B. General Requirements for Fire-Alarm Control Unit:
 - 1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

- a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
- b. Include a real-time clock for time annotation of events on the event recorder and printer.
- c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
- d. The FACP shall be listed for connection to a central-station signaling system service.
- e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
- 2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
- 3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.
- C. Alphanumeric Display and System Controls: Arranged for interface between human operator at firealarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
 - 1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
 - 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- D. 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 50 addressable devices on each signaling-line circuit.
 - 4. Serial Interfaces:
 - a. One dedicated RS 485 port for central-station operation using point ID DACT.
 - b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
 - c. One USB port for PC configuration.
 - d. One RS 232 port for voice evacuation interface.
- E. Notification-Appliance Circuit:
 - 1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
 - 2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
 - 3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- F. Elevator Recall:
 - 1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.

- 2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
- 3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
 - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- G. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smokebarrier walls shall be connected to fire-alarm system.
- H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- I. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center as a special module that is part of fire-alarm control unit.
 - 1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.
 - a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
 - b. Programmable tone and message sequence selection.
 - c. Standard digitally recorded messages for "Evacuation" and "All Clear."
 - d. 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 fire-alarm control unit.
 - 2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
 - 3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.
- J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
 - 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- K. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
 - 1. Batteries: Vented, wet-cell pocket, plate nickel cadmium.

2.5 MANUAL FIRE-ALARM BOXES

- A. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer as FACP.
- B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

- 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
- 2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer as FACP.
- B. General Requirements for System Smoke Detectors:
 - 1. Comply with UL 268; operating at 24-V dc, nominal.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 - 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.
- C. Photoelectric Smoke Detectors:
 - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 - 2. An operator at fire-alarm control unit, having the designated access level, shall 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.).
- D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
 - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 - 2. An operator at fire-alarm control unit, having the designated access level, shall 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.).
 - 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
 - 4. Each sensor shall have multiple levels of detection sensitivity.
 - 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
 - 6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer as FACP.

- B. General Requirements for Heat Detectors: Comply with UL 521.
 - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

- A. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer as FACP.
- B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.
- D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 4. Flashing shall be in a temporal pattern, synchronized with other units.
 - 5. Strobe Leads: Factory connected to screw terminals.
 - 6. Mounting Faceplate: Factory finished, red.
- E. Voice/Tone Notification Appliances:
 - 1. Comply with UL 1480.
 - 2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
 - 3. High-Range Units: Rated 2 to 15 W.
 - 4. Low-Range Units: Rated 1 to 2 W.
 - 5. Mounting: semirecessed.
 - 6. Matching Transformers: Tap range matched to acoustical environment of speaker location.
- F. Exit Marking Audible Notification Appliance:
 - 1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
 - 2. Provide exit marking audible notification appliances at the entrance to all building exits.
 - 3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.9 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
 - 1. Electromagnets: Require no more than 3 W to develop 25-lbf (111-N) holding force.
 - 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 - 3. Rating: 24-V ac or dc.
- B. Material and Finish: Match door hardware.

2.10 ADDRESSABLE INTERFACE DEVICE

- A. General:
 - 1. Include address-setting means on the module.
 - 2. Store an internal identifying code for control panel use to identify the module type.
 - 3. Listed for controlling HVAC fan motor controllers.
- B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.
 - 1. Allow the control panel to switch the relay contacts on command.
 - 2. Have a minimum of two normally open and two normally closed contacts available for field wiring.
- D. Control Module:
 - 1. Operate notification devices.
 - 2. Operate solenoids for use in sprinkler service.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall 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 the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address of the supervisory signal.

- 3. Address of the trouble-initiating device.
- 4. Loss of ac supply.
- 5. Loss of power.
- 6. Low battery.
- 7. Abnormal test signal.
- 8. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.12 NETWORK COMMUNICATIONS

- A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.
- B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.
- C. Provide integration gateway using UAB Network Protocol for connection to building automation system.

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 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all 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 all other trades have completed cleanup shall be replaced.
 - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.
- C. Manual Fire-Alarm Boxes:
 - 1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
 - 2. Mount manual fire-alarm box on a background of a contrasting color.

- 3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- D. Install a cover on each smoke detector that is not placed in service during construction. Cover shall 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 the full width of duct. Tubes more than 36 inches (9100 mm) long shall 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. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- H. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.
- J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS

- A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.
 1. Exposed pathways located less than 96 inches (2440 mm) above the floor shall be installed in EMT.
- B. Pathways shall be installed in EMT.
- C. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

- A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
 - 2. Magnetically held-open doors.
 - 3. Alarm-initiating connection to elevator recall system and components.
 - 4. Alarm-initiating connection to activate emergency lighting control.
 - 5. Supervisory connections at valve supervisory switches.
 - 6. Supervisory connections at elevator shunt-trip breaker.
 - 7. Data communication circuits for connection to building management system.
 - 8. Data communication circuits for connection to mass notification system.
 - 9. Supervisory connections at fire-extinguisher locations.

- 10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
- 11. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals.
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
- D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION



02/16/2024

Applicable for Sections: 31 2000, 31 2500, 32 1313, and 32 1613,

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. <u>Perform excavation by hand within 5'-0" of existing buildings and</u> <u>structures to remain</u>. 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 <u>STRUCTURES</u>. In the event of conflict during construction, notify Architect prior to proceeding with work in the effected area.

- d. Compaction of backfill at any basement and below grade walls shall <u>only</u> <u>be by hand-directed compaction equipment</u>. Heavy construction equipment and/or heavy trucks <u>shall not be allowed within 10-feet of any</u> <u>basement walls</u>, 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 <u>is included</u> 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:
- 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.

- 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. <u>Perform excavation by hand</u> 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. <u>Do not under-mine or excavate below footings and/or foundations which</u> are to remain.

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.

Liquid Limit (LL)	Less than 50%
Plasticity Index (PI)	Less than 30%
Maximum Dry Density (ASTM D-698)	Greater than 95 pcf
Maximum Particle Size	3 inches or less
Organic Matter	Less than 5%

- 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 (<u>Grassed areas only</u>; 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

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. <u>Perform excavation by hand within 5'-0" of existing buildings and structures to remain.</u>
 - 1. <u>Do not under-mine or excavate below footings and/or foundations which are to</u> 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.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

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 <u>not</u> 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:
 - 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:
 - 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 backof-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 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. <u>In no case</u> 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.
 - 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.
 - 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

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 transfer, 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.

- 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 TM, or approved equal for inlet protection.
- G. High Density Poly-Ethylene (HDPE) Filters or Silt-SaverTM, 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

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#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 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. Moisten 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-toline 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 stiffbristled 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

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

- 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 10feet. 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