PROJECT MANUAL

RAINBOW CITY RECREATIONAL CENTER

Rainbow City, Alabama

for

The City of Rainbow City, Alabama
(Local Funds)

May 28, 2024

ISSUED FOR BID

Prepared By

GMC

Goodwyn Mills Cawood, LLC.
2400 5th Avenue South, Suite 200
Birmingham, AL 35233
T 205.879.4462
www.gmcnetwork.com

GMC PROJECT NUMBER: ABHM230021

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.

These documents may not be used or relied upon as a certification of information indicated, or used for any other project, by any third parties or other parties, for any purpose whatsoever, without the prior written consent of Goodwyn Mills Cawood, LLC., or prior to receipt of mutually agreed to compensation paid to Goodwyn Mills Cawood, LLC., therefor.

GOODWYN MILLS CAWOOD, LLC.

GMCNETWORK.COM

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:
   1. Address Line 1: 3700 Rainbow Drive.
   2. City: Rainbow City.
   3. State: AL.
   4. Zip Code: 35906-6324.
   5. Telephone: 256-442-2511.

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: Mayor.
   2. Name: Joe Taylor.

1.03 CONSULTANTS:

A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Company Name: Goodwyn, Mills & Cawood, Inc..
      a. Address Line 1: 2400 5th Ave South.
      b. Address Line 2: Suite 200.
      c. City: Birmingham.
      d. State: AL.
      e. Zip Code: 35233.
      f. Telephone: 205-879-4462.
   2. Primary Contact:
      a. Title: Project Manger.
      b. Name: Jeff Miller.

B. Civil Engineering Consultant:
   1. Company Name: GMC, LLC..
      a. Address Line 1: 2400 5th Ave South.
      b. Address Line 2: Suite 200.
      c. City: Birmingham.
      d. State: AL.
      e. Zip Code: 35233.
      f. Telephone: 205-879-4462.
   2. Primary Contact:
      a. Title: Civil Engineer.
      b. Name: Corey Shoop.

C. Landscape Architecture Consultant:
   1. Company Name: GMC, LLC..
      a. Address Line 1: 2400 5th Ave..
      b. Address Line 2: 200.
      c. City: Birmingham.
      d. State: AL.
      e. Zip Code: 35233.
      f. Telephone: 205-879-4462.

2. Primary Contact:
    a. Title: Landscape Architect.
    b. Name: Natali Herrmann.

D. Structural Engineering Consultant:
1. Company Name: Tucker Jones Engineers Associated.
    a. Address Line 1: 3300 Cahaba Road.
    b. Address Line 2: Suite 210.
    c. City: Birmingham.
    d. State: AL.
    e. Zip Code: 35233.
    f. Telephone: 205-879-5660.
2. Primary Contact:
    a. Title: Principal.
    b. Name: Greg Tucker.

E. Mechanical Engineering Consultant - HVAC / Plumbing / Fire Protection Engineering Consultant:
1. Company Name: Bernhard TME.
    a. Address Line 1: 400 Vestavia Parkway.
    b. Address Line 2: Suite 310.
    c. City: Vestavia Hills.
    d. State: AL.
    e. Zip Code: 35216.
2. Primary Contact:
    a. Title: Project Manager.
    b. Name: Jared Deerman.

F. Electrical Engineering Consultant:
1. Company Name: Jackson Renfro & Associates.
    a. Address Line 1: 31 Inverness Center Parkway.
    b. Address Line 2: Suite 300.
    c. City: Birmingham.
    d. State: AL.
    e. Zip Code: 35242.
2. Primary Contact:
    a. Title: Senior Principal.
    b. Name: Bobby Renfro.

G. Civil Engineering Consultant: Pool Design Engineer
1. Company Name: Schoel Engineering Company.
    a. Address Line 1: 1001 22nd St S.
    b. City: Birmingham.
    c. State: AL.
    d. Zip Code: 35205.
2. Primary Contact:
    a. Title: Project Manager.
    b. Name: Chase Douglas.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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DIVISION 21 -- FIRE SUPPRESSION

DIVISION 22 -- PLUMBING

DIVISION 23 -- HEATING, VENTILATING, AND AIR CONDITIONING

DIVISION 26 -- ELECTRICAL

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ADVERTISEMENT FOR PREQUALIFICATION AND BIDS

PREQUALIFICATION PROPOSALS will be received via email, or other electronic transmission, on behalf of the Owner by Goodwyn Mills Cawood, LLC., at 2400 5th Avenue South, Ste. 200, Birmingham, AL 35233, for the below referenced project, until **2:00 PM Local Time, May 17, 2024.** The prequalification procedure is intended to identify responsible and competent bidders relative to the requirements of the Project. Prequalification proposal requirements may be obtained from the Architect, by request either by phone (205.879.4462) or e-mail alyssa.martin@gmcnetwork.com, to Alyssa Martin. Additional qualifications and requirements for General Contractor Bidders and separate Subcontractors are indicated in the Bid and Contract Documents.

SEALED PROPOSALS will be received only from previously PRE-QUALIFIED General Contractors by The City of Rainbow City, at the Rainbow City Community Center, located at 3702 Rainbow Drive, Rainbow City, Alabama 35906 until 2:00 PM Local Time, June 27, 2024 for this project:

RAINBOW CITY RECREATION CENTER
Rainbow City, ALABAMA for
The City of Rainbow City, Alabama

(LOCALLY FUNDED)

at which time and place they will be publicly opened and read.

A cashiers check or bid bond payable to The City of Rainbow City, Alabama 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, 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 (Plans, Specifications, and Addenda) will be sent to prequalified General Contractors only from the Architect electronically with no deposit. Subcontractors should contact a General Contractor or plan room for documents.

Only General Contractors who have completed the prequalification process within the stated time limits, and which are properly licensed in accordance with criteria established by the State Licensing Board for General Contractors under the Provision of Title 34, Chapter 8, Code of Alabama, 1975, as amended, will be considered for prequalification for the Work of this project.

A **MANDATORY PRE-BID CONFERENCE** will be held at the same location as bids are to be opened, at **10:00 AM local time May 31, 2024** for the purpose of reviewing the project and answering Bidder's questions. **Attendance at the Pre-Bid Conference IS REQUIRED for all General Contractor Bidders** intending to submit a Proposal, and is highly recommended for Subcontractors. Bids from General Contractors not attending the Pre-Bid Conference will be rejected.

Per the Owner and the Alabama Department of Revenue (ADOR), Act 2013-205, the project will be bid **EXCLUDING TAXES** and will require the Contractor to complete DCM Form C-3A Accounting of Sales Tax Attachment to DCM Form C-3 Proposal Form (August 2020) which will be submitted with the Contractors Proposal at the time of the Bid. If awarded the bid, both tax exempt entity and

contractor shall apply for certificates of exemption. ADOR shall issue certificates of exemption from sales and use tax for each tax exempt project. 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. ADOR will handle the administration of the certificates and the accounting of exempt purchases.

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

The City of Rainbow City
2700 Rainbow Drive
Rainbow City, Alabama, 35906

GOODWYN MILLS CAWOOD, LLC.
MEMBERS, AMERICAN INSTITUTE OF ARCHITECTS
2400 5th Avenue South, Suite 200
Birmingham, Alabama 35233
Phone: (205) 879-4462
Fax: (205) 879-4493

****

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.

DCM Form C-1; August 2020.
REVISED (GM&C): February 2021.

PREQUALIFICATION PROPOSAL REQUIREMENTS

PROJECT: RAINBOW CITY RECREATION CENTER

1.1 Written Submittal - To include at least each of the following items:
(Note that failure to provide all information requested, and failure to provide full disclosure will be deemed non-responsive by the Owner and as just cause for rejection of any prequalification submittal).

A. Completed Registration/Order Form.
B. Completed American Institute of Architects (AIA) Document A305, "Contractor's Qualification Statement", latest edition, which may be purchased from an A.I.A. documents vendor by the Contractor.

1. A draft copy of AIA A305 is attached for reference.

B. Include a list of projects of similar types, size, scope and complexity which have been completed by the company submitting this prequalification proposal.

1. Include name, address and telephone number of Owner, Architect, any Construction Manager, and the original and final Contract amounts.

2. A minimum of three (3) such similar projects in size and scope, within the last 7 years, will be required for prequalification.

C. Confirmation that insurance and bonding requirements of the Alabama Building Commission can and will be furnished, and a letter of confirmation from your company's underwriter, broker, and/or agent indicating bonding limits, and that the required liability insurance with stated limits and other required provisions, is either in place or obtainable by the company submitting this prequalification proposal.

D. Corporate/Company overview and philosophy/mission statement.

E. Organizational chart of company structure.

F. Resumes of key personnel anticipated to be involved in this particular project, including at least the following (*) required personnel:

1. Principal*
2. Project Manager*
3. General Superintendent*
4. Quality Control Superintendent*
5. Any other staff that may be involved.

G. Provide a brief description of your company's safety program (including in part, your substance abuse program); quality control program; and "partnering" program, training or experience.

H. Provide description of how your company normally provides warranty and guarantee services.

I. Provide (and list, if applicable) your company's OSHA accident frequency rates and Alabama workers compensation modifier.

1.2 Refer to Advertisement for additional information and requirements regarding prequalification.

A. Note that State of Alabama Division of Construction Management requirements, except as modified in Bid and Contract Documents, will be applicable to the Work of this project.

B. Note that following this Prequalification process and legal advertisement for bids, a Pre-Bid Conference will be held, and attendance by Prequalified General Contractors will strongly encouraged.

1.3 Submittal Deadline: 2:00 PM, MAY 17, 2024

1.4 Number of Copies to be Submitted: One (1) Digital.

1.5 Submit one copy To:

Goodwyn Mills Cawood, LLC.
2400 5th Avenue South, Suite 200
Birmingham, AL 35233
Attn: Alyssa Martin
Alyssa.martin@gmcnetwork.com

Phone: (205) 879-4462
Fax: (205) 879-4493

END OF PREQUALIFICATION PROPOSAL REQUIREMENTS

DRAFT AIA® Document A305® – 2020
Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

« »

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

« »

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

« »

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

« »

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

« »

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

« »

.2 If your organization is a partnership, identify its partners and its date of organization.

« »

.3 If your organization is individually owned, identify its owner and date of organization.

« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

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.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

« »

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

« »

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

« »

§ A.1.3.2 How many full-time employees work for your organization?

« »

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

« »

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

« »

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

« »

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

« »

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

« »

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

« »

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

« »

§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

« »

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

« »

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

« »

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

« »

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

« »

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

« »

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

« »

DRAFT AIA® Document A305® – 2020
Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

§ B.1 FINANCIAL
§ B.1.1 Federal tax identification number:

« »

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

« »

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

« »

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

« »

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS
§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

« »

§ B.2.2 In the last five years has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

« »

.2 been terminated for any reason except for an owners' convenience?

« »

.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

« »

.4 filed any lawsuits or requested arbitration regarding a construction project?

« »

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

« »

.2 had any business or professional license subjected to disciplinary action?

« »

.3 been penalized or fined by a state or federal environmental agency?

« »

DRAFT AIA® Document A305® – 2020
Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

« »
« »

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

« »

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

« »

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

« »

§ C.1 PERFORMANCE OF THE WORK
§ C.1.1 When was the Contractor's Project Office established?

« »

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

« »

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

« »

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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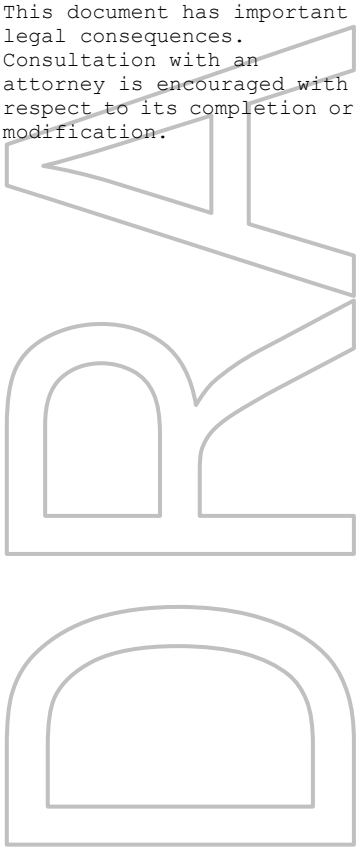

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« »

§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

« »

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

« »

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

« »

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

« »

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

« »

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

« »

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

« »

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

« »

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

§ C.4.2 If requested, will your organization be able to provide property insurance for the Project written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis?

« »

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.2? If so, identify.

« »

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

« »

§ C.5.2 Surety company name:

« »

§ C.5.3 Surety agent name and contact information:

« »

§ C.5.4 Total bonding capacity:

« »

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

« »

DRAFT AIA® Document A305® – 2020
Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☑ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

DRAFT AIA® Document A305® – 2020
Exhibit E

Contractor's Past Project Experience, Continued

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☑ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

ADDITIONS TO A.I.A. INSTRUCTIONS TO BIDDERS

1.1 A.I.A. INSTRUCTIONS TO BIDDERS:

A. Printed Form A701, "Instructions to Bidders", (1997 edition) issued by the American Institute of Architects, is part of these specifications as if written in full herein. A draft copy of this form is attached for reference. In case of conflict, these specifications take precedence over and modify aforesaid AIA Instructions to Bidders. Submission of a proposal will be evidence that the articles have been examined, read, and accepted as part of these contract documents, including the revisions as noted hereinafter.

1.2 ADDITIONS TO A.I.A. INSTRUCTIONS TO BIDDERS:

A. In Article 3 – BIDDING DOCUMENTS, add the following:

"3.3 SUBSTITUTIONS

a. Change paragraph 3.3.2 to allow requests for approval of substitution to be received by the Architect up to five (5) calendar days prior to bid date. Such requests for approval of substitutions shall include the completed Substitution Request Form, and the complete substitution package shall be submitted through a qualified General Contractor bidding the project, with his/her approval."

B. In Article 4 - BIDDING PROCEDURES, add the following:

"4.5 PROPOSAL

a. Proposal shall not contain any recapitulation of work to be done.

b. Telegraphic modifications will be considered if received by the Owner before opening hour, provided a letter of confirmation is received by the Owner within 48 hours thereafter.

c. Proposal shall be delivered enclosed in an opaque envelope marked **"RAINBOW CITY RECREATION CENTER For THE CITY OF RAINBOW CITY"**, and shall bear the name and address of the bidder and their Alabama General Contractor License Number.

d. Proposals shall be submitted on Proposal Forms provided; Numbers shall be both in writing and in figures. If words and figures conflict, the words shall govern. Addenda, if any, must be acknowledged. Signature shall be in long hand and in ink, and forms shall be complete without interlineation, alterations or erasures. Anyone signing proposal and contract as an agent of a firm or corporation shall present legal evidence of their authority.

4.6 CERTIFIED CHECKS OR BID BONDS

a. Each proposal must be accompanied by a certified check or bid bond issued by an acceptable surety company for not less than 5% of the bid, but in no event more than $10,000 made payable to the Owner, as a guarantee that the successful Bidder will, within 10 days from receipt of notice to that effect, enter into a contract for performance of the work awarded to them. Proceeds of the check or Bid Bond will become property of the

Owner if the bidder withdraws from competition after opening of bids or fails to execute the required contract or bonds, if their bid is accepted by Owner."

C. In Article 7 - PERFORMANCE BOND AND PAYMENT BOND, add the following:

"7.3 PERFORMANCE BOND AND PAYMENT BOND

7.3.1 Performance and Payment Bond equal to 100% of the contract price will be required of the Bidder to whom the contract or any part(s) of the contract is awarded. This bond must be acceptable to the Owner, and shall be attached (along with acceptable insurance certificate(s) in compliance with requirements) to each copy of the contract executed by the Contractor.

7.3.2 Performance Bond shall also extend as a maintenance bond for one year after the date of acceptance of the entire project. Said bond shall guarantee against defective materials and workmanship which may develop during that time, in any portion of the work included in the contract.

7.3.3 Performance Bond and Labor and Material Payment Bond shall be executed on AIA Document A312, copies of which are available for viewing in the office of the Architect, and which can be purchased from an AIA documents vendor by the Contractor and/or their surety."

END OF ADDITIONS TO A.I.A. INSTRUCTIONS TO BIDDERS

AIA® Document A701™ – 2018

Instructions to Bidders

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

THE OWNER:
(Name, legal status, address, and other information)

THE ARCHITECT:
(Name, legal status, address, and other information)

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

.1 the Bidder has read and understands the Bidding Documents;

.2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;

.3 the Bid complies with the Bidding Documents;

.4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;

.5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and

.6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.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.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Additions and Deletions Report for

AIA® Document A701™ – 2018

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 13:51:45 ET on 05/23/2019.

There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 13:51:45 ET on 05/23/2019 under Order No. 1831144354 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders , as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

STATE OF ALABAMA
BUILDING COMMISSION
770 WASHINGTON AVE
SUITE 444
Montgomery, Alabama 36130-1150
Telephone: (334) 242-4082
Fax: (334) 242-4182

ROBERT BENTLEY
Governor

Katherine Lynn
Director

October 28, 2013

TO: **STATE AGENCIES, K-12 SUPERINTENDENTS, COMMUNITY COLLEGES, UNIVERSITIES**

FROM: **KATHERINE LYNN, DIRECTOR**
ALABAMA BUILDING COMMISSION

SUBJECT: **ACT 2013-205, CERTIFICATE OF EXEMPTION FROM SALES AND USE TAX FOR GOVERNMENTAL ENTITIES**

Act 2013-205 was signed into law on May 9, 2013, granting the Alabama Department of Revenue (ADOR) the authority to issue certificates of exemption from sales and use taxes for construction projects for certain governmental agencies.

Summary

The full text of Act 2013-205 is available on the Building Commission's website at www.bc.alabama.gov. A brief summary of the Act is provided below:

- ADOR shall issue certificates of exemption from sales and use tax to governmental entities for each tax exempt project. Both the governmental entity and the contractor shall apply for certificates of exemption.
- Certificates of exemption shall only be issued for contracts entered into (awarded) on or after Jan. 1, 2014.
- 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 from sales and use tax are building materials, construction materials and supplies and other tangible personal property that become part of the structure per the written construction contract.
- ADOR will handle the administration of certificates of exemption and the accounting of exempt purchases. ADOR will have the ability to levy fines and may bar the issuance or use of certificates of exemption upon determination of willful misuse by the contractor or a subcontractor.
- The contractor shall account for the tax savings on the bid form.

Bidding of Projects Before Jan. 1, 2014

Projects bid before Jan 1, 2014 but awarded on or after Jan. 1, 2014 are still eligible for sales tax exemption regardless of whether the project was bid with or without sales tax. For projects bid before Jan. 1, 2014, the bid documents must specify if the contractor's bid shall or shall not include sales tax.

For projects bid before Jan. 1, 2014, if the project is bid with sales tax and the contractor and subcontractors purchase the materials tax exempt, prior to project closeout the contractor shall submit to the governmental entity a copy of the report filed with the Alabama Department of Revenue showing all exempt purchases. The actual sales tax savings indicated on the report shall be deducted from the final contract amount.

For projects bid after Jan. 1, 2014, the bid shall not include sales tax but the sales tax for the base bid and all bid items must be included on the contractor's bid proposal form. ABC Form C-3A indicates how the sales tax shall be accounted for on the bid proposal form and shall be modified by the project architect or engineer as appropriate for the bid items for each project. **Failure of the contractor to complete the attachment to the bid proposal form indicating the sales tax as required by Act 2013-205, Section 1 (g) shall render the bid non-responsive.**

Proposed Changes to Administrative Rules

Pursuant to Act 2013-205, the ADOR has proposed changes to the following administrative rules:

Rule 810-6-1-.46	Contractor's Liability
Rule 810-6-1-.46.01	Bleacher Systems, Lockers, Backstops, and Other Fixtures Installed in Gymnasiums
Rule 810-6-3-.77	Exemption for Certain Purchases by Contractors and Subcontractors in Conjunction with Construction Contracts with Certain Governmental Entities

A link to the proposed rules and information about the public hearings can be found on ADOR's website at http://www.revenue.alabama.gov/analysis/upcoming-rule-hearings.cfm . All interested parties may present their views in writing to the **Secretary of the Alabama Department of Revenue, Room 4131, Gordon Persons Building, 50 N Ripley Street, Montgomery, Alabama 36132** at any time during the thirty-five (35) day period following publication of the notice or by appearing at the hearing.

If you have any questions, please feel free to contact Katherine Lynn at the Alabama Building Commission at (334) 242-4082 or the Alabama Department of Revenue at (334) 242-1170.

cc: Ms. Julie Magee, Commissioner, Alabama Department of Revenue
Mr. Ben Albritton, Assistant Attorney General

PROPOSAL FORM

To: THE CITY OF RAINBOW CITY, ALABAMA **Date:** _____
(Awarding Authority)

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:** RAINBOW CITY RECREATION CENTER, Rainbow City, Alabama, for THE CITY OF RAINBOW CITY, ALABAMA in accordance with Drawings and Specifications, dated May 28, 2024, prepared by GOODWYN MILLS CAWOOD, LLC. (Architect's Project No. ABHM230021), 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.

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

_____ Dollars ($_____)

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

For Alternate No. 1 - Add Amphitheater:

(Add) _____ Dollars ($_____)

For Alternate No. 2- Landscape and Hardscape Variation at Splash Pad Location:

(Add) _____ Dollars ($_____)

For Alternate No. 3 - Landscape and Hardscape Variation at Playground Location:

(Add) _____ Dollars ($_____)

ALLOWANCES: Refer to Section 01 2100 – "Allowances", and Drawings for descriptions and requirements.
(Allowance Calculations DUE along with Proposal Form on Bid Date.)

COMPLETION DATE: All Base Bid and any Alternate Work in the Contract shall be "Substantially Complete" within 425 consecutive days, from the earlier of either the date of the Owner's written "Notice To Proceed" or the Contractor's receipt of the fully executed Contract.

UNIT PRICES: Refer to "Attachment A to Proposal Form"
(Attachment A to Proposal Form DUE along with Proposal Form on Bid Date).

MAJOR SUBCONTRACTOR & SUPPLIER LISTING: Refer to "Attachment B to Proposal Form"
(DUE along with Proposal Form on Bid Date, or at Contractor's option, turned in to the Owner within 24-hours after receipt of Bids, with a copy to the Architect).

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).

IMMIGRATION STATUS VERIFICATION: Refer to "General Conditions" portion of the Project Manual.
(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.)*

☐ Bid Bond, executed by _____ as Surety,

☐ a cashier's check on the _____ Bank of _____,

for the sum of _____ Dollars

($_____) made payable to the Awarding Authority.

BIDDER'S ALABAMA LICENSE:

State License for General Contracting: _____

License Number 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, 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

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 Contractor accounts for the sales tax NOT included in the bid proposal form as follows:

ESTIMATED SALES TAX AMOUNT

BASE BID: …….$ _____

Alternate No. 1 (Add Amphitheater)	(add)	$ _____
Alternate No. 2 (Splash Pad Scope Variation)	(add)	$ _____
Alternate No. 3 (Playground Scope Variation)	(add)	$ _____

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

Legal Name of Bidder _____

Mailing Address _____

* **By (Legal Signature)** _____

* Name (type or print) _____ *(Seal)*

* Title _____

Telephone Number _____

JULIE P. MAGEE
Commissioner

State of Alabama
Department of Revenue
(www.revenue.alabama.gov)
50 North Ripley Street
Montgomery, Alabama 36132

MICHAEL E. MASON
Assistant Commissioner
JOE W. GARRETT, JR.
Deputy Commissioner
CURTIS E. STEWART
Deputy Commissioner

Alabama Department of Revenue
NOTICE

Tax Guidance for Contractors, Subcontractors and Alabama Governmental Entities Regarding Construction-related Contracts

Legislative Act 2013-205 requires the Department of Revenue to issue Form STC-1, *Sales and Use Tax Certificate of Exemption for Government Entity Projects,* to all contractors and subcontractors working on qualifying governmental entity projects once the Form ST: EXC-01 is approved.

Each exempt entity, contractor and subcontractor must make application for qualification of the exemption using Form ST: EXC-01 for each tax-exempt project. The application is available on the department's website at http://revenue.alabama.gov/salestax/ST-EXC-01.pdf. Applications should be submitted directly to the Sales and Use Tax Division Central Office, P.O Box 327710, Montgomery, AL 36132-7710.

The sales and use tax exemption provided for in Act 2013-205 applies to the purchase of building materials, construction materials and supplies, and other tangible personal property that become part of the structure pursuant to a qualifying contract entered into on or after January 1, 2014. Qualifying projects and contracts are those generally entered into with the following governmental entities, unless otherwise noted: the State of Alabama, a county or incorporated municipality of Alabama, an Alabama public school, or an Alabama industrial or economic development board or authority already exempt from sales and use taxes. **Please note that contracts entered into with the federal government and contracts pertaining to highway, road, or bridge construction or repair do not qualify for the exemption provided for in Act 2013-205.** [Reference: Sales and Use Tax Division Administrative Rule 810-6-3-.77 *Exemption for Certain Purchases by Contractors and Subcontractors in Conjunction with Construction Contracts with Certain Governmental Entities.*]

The Alabama Department of Revenue will assign each contractor and sub-contractor a consumers use tax account, if one is currently not in place, at the time the Form STC-1, Sales *and Use Tax Certificate of Exemption for Government Entity Projects*, is issued.

Contractors and sub-contractors for qualifying projects will be required to file monthly consumers use tax returns and report all exempt purchases for ongoing projects, as well as all taxable purchases on one return. These returns are required to be filed through the department's online tax return filing and payment portal, My Alabama Taxes (https://myalabamataxes.alabama.gov).

As another option for these types of contracts, as well as with other contracts entered into with other types of exempt entities, the Form ST:PAA1, *Purchasing Agent Appointment*, may be used. However, please be advised that the use of the Form ST:PAA1 option will require the exempt entity to be invoiced directly and pay for directly from their funds any construction and building material and supply purchases.

For additional information concerning this guidance, taxpayers should contact Sales and Use Tax Division representative Thomas Sims at 334-242-1574 or by email at Thomas.Sims@revenue.alabama.gov.

ALABAMA DEPARTMENT OF REVENUE
SALES AND USE TAX DIVISION
P.O Box 327710 • Montgomery, AL 36132-7710

ST: EXC-01
1/14

Application For Sales and Use Tax Certificate of Exemption

FOR GOVERNMENT ENTITY PROJECT

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

PROJECT INFORMATION:

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

APPLICANT'S INFORMATION:

RELATION: *(CHOOSE ONE)*	NAICS CODE
☐ Exempt Entity ☐ General Contractor ☐ Sub-Contractor	
APPLICANT'S LEGAL NAME	FEIN
DBA	CONSUMER'S USE TAX ACCOUNT NUMBER

MAILING ADDRESS

CONTACT PERSON	BUSINESS TELEPHONE NUMBER
	( )

ESTIMATED START DATE	ESTIMATED COMPLETION DATE

REASON EXEMPTION IS CLAIMED

JOB DESCRIPTION

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE?	ESTIMATED POLLUTION CONTROL COST
☐ Yes ☐ No	$

TOTAL BID AMOUNT	LABOR COST	MATERIAL COST
$	$	$

PROJECT NAME	PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

☐ Individual ☐ Partnership ☐ Corporation ☐ Multi member LLC ☐ Single member LLC

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

OWNERSHIP INFORMATION:

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

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

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

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

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

NAME *(PLEASE PRINT)* _____ SIGNATURE _____

TITLE _____ DATE _____

Exempt entity must provide a copy of the contract accepted by the General Contractor. The General Contractor must provide a copy of the contract and a list of sub-contractors to the Department of Revenue, Sales and Use Tax Division. Any updates, additions and/or deletions, must also be submitted to the Department within 30 days of occurrence.

REVENUE DEPARTMENT USE ONLY

Examiner's Remarks _____

Examiner _____ Date _____

Supervisor's Recommendation _____

Supervisor _____ Date _____

IMMIGRATION STATUS VERIFICATION

1.1 GENERAL:

A. Bidders are hereby reminded that they are required to comply with requirements of Alabama Immigration Law, Act 2011-535 (also referred to as the "Beason-Hammon Alabama Taxpayer and Citizen Protection Act", or H.B. 56). This Law was amended by Act No. 2012-491 and signed into law by the Governor May 18, 2012. The following requirements are in effect:

1. Contractors are required to enroll in the E-Verify program of the United States Department of Homeland Security and to provide documentation of enrollment in the E-Verify program with their contracts and agreements. E-Verify MOU shall be submitted with Proposal Form.

2. Statement of Compliance with Act No. 2012-491 shall be attached to Construction Contract, and shall include the following statement:

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

B. Additional information and Guidance is available at the following websites:

1. E-Verify portal maintained by State of Alabama: http://immigration.alabama.gov

2. Alabama Department of Finance, Comptroller's Website - Compliance Guidelines: http://comptroller.alabama.gov/pdfs/Memos/2012-01-06%20Alabama%20Immigration%20Law.pdf

3. Alabama Secretary of State's Website: Including in part, rules and acceptable form for affidavits for business entities, employers, contractors, and subcontractors. http://www.sos.state.al.us/

4. Alabama Building Commission: http://www.bc.state.al.us/Memo%20on%20Act%202011-535-Alabama%20Immigration%20Law-1-11-2012.pdf

5. US Department of Homeland Security, E-Verify: www.dhs.gov/E-Verify

BID BOND FORM

1.1 Bid Bond shall be executed equivalent to AIA Document A310, Bid Bond. A draft copy is attached for reference. Copies of A310 are available for viewing in the office of the Architect, and may be purchased from an AIA documents vendor by the Contractor.

END OF BID BOND FORM

DRAFT

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

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

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

BOND AMOUNT: $ « »

PROJECT:
(Name, location or address, and Project number, if any)

« .»
« »
« »

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom 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.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

Signed and sealed this « » day of « » , « »

	« »
	(Principal) *(Seal)*
	« »
(Witness)	*(Title)*
	« »
	(Surety) *(Seal)*
	« »
(Witness)	*(Title)*

CONSTRUCTION CONTRACT FORM

1.1 The Construction Agreement shall be executed on A.I.A. Document A101 - 2017 Edition, a copy of which is attached for reference. Copies are available for viewing in the office of the Architect, and may be purchased from an A.I.A. documents vendor by the Contractor.

END OF CONSTRUCTION CONTRACT FORM

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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

BETWEEN 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)

« »
« »
« »

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

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and 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

§ 3.1 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 Work.)

« »

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 are to 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, if any, included in the Contract Sum:

Item	Price

§ 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, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« »

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

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 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:

« »

§ 5.1.3 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 Payment.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 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.

§ 5.1.5 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;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the 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 any, 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

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each 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.)

« »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 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 for 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 A201–2017.

§ 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

§ 5.2.1 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 Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and 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

§ 6.1 Initial 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.)

« »
« »
« »
« »

§ 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

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 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 convenience.)

« »

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 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)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 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 Form 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.

§ 8.6 Notice 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 format 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 CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–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 the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless 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	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to 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 Contract 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 name and title)	*(Printed name and title)*

PERFORMANCE BOND AND PAYMENT BOND FORM

1.1 Performance and Payment Bond shall be provided for 100% of the Contract amount, and shall be executed on AIA Document A312, latest edition. A draft of AIA Document A312 – 2010 is attached. Copies of document are available for viewing in the office of the Architect, and can be purchased from an AIA documents vendor by the Contractor and/or their surety.

END OF PERFORMANCE BOND AND PAYMENT BOND FORM

DRAFT

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)

« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

« .»
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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.

DRAFT

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 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 shall 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.

§ 5 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,

.1 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; and

§ 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.

§ 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.

§ 12 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 (1) 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 (1) 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.

§ 13 Notice 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.

§ 14 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 herefrom 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.

§ 15 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 Claim. 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;
.5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in 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.

§ 16.4 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.

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

§ 17 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.

§ 18 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:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

DRAFT

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

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

« »« »
« »

OWNER:
(Name, legal status and address)

« »« »
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

« .»
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 16

CONTRACTOR AS PRINCIPAL		SURETY	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

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ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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.

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§ 1 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 and the Surety 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;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the 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 Surety 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;

§ 5.2 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 qualified 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 and 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.

§ 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 Construction 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.

§ 11 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.

§ 13 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 herefrom 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.

§ 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.

§ 15 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:

« »

(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:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

1.1 The "General Conditions of the Contract for Construction," A.I.A. Document A201, 2017 Edition, (also referred to as "General Conditions", "Conditions of the Contract", etc.), Articles 1 through 15, inclusive, is a part of this contract, and is incorporated herein as fully as if here set forth.

1.2 Copies of A.I.A. Document A201 are available for viewing in the office of the Architect, and can be purchased from an A.I.A. documents vendor by the Contractor.

1.3 See "Supplementary Conditions" and "Special Conditions" for supplements which modify, change, delete, and/or add to the General Conditions.

1.4 A draft copy of A201 – 2017 is attached for reference.

END OF GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

DRAFT

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 status and address)

« »« »
« »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract 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 Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction 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.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and 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.

§ 1.1.4 The Project

The Project is the total construction of which the Work 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.

§ 1.1.6 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 similar 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 Correlation and Intent of the Contract Documents

§ 1.2.1 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.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any 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.

§ 1.2.2 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" and "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 Other Instruments of Service

§ 1.5.1 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 Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, 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.

§ 1.5.2 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 authorization shall bear the copyright notice, if any, 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™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, 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 forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, 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 General

§ 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.

§ 2.1.2 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 (1) 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 it 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 Contractor 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

§ 2.3.1 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.

§ 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 Work.

§ 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 Contract 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 6.1.3.

§ 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 the 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

§ 3.1.1 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.

§ 3.1.2 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.

§ 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. It 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 Contractor 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.

§ 3.3.2 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.

§ 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, after 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

§ 3.5.1 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 Contractor 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, or 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 yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, 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, rules 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 (1) 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 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 Unless 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;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and 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 (1) 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 promptness.

§ 3.9 Superintendent

§ 3.9.1 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

§ 3.10.1 The Contractor, promptly after being awarded the Contract, 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 date 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 Project.

§ 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 (1) 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.

§ 3.10.3 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.

§ 3.12.2 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.

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

§ 3.12.4 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 submittals 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, unless 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 Construction 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 resubmission shall not apply to such revisions.

§ 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.

§ 3.12.10.1 If professional design services or certifications by a design professional 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, rules 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

§ 3.14.1 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.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the 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 The 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.

§ 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 known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 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.

§ 3.18.2 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

§ 4.2.1 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 the 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 Contract Documents.

§ 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 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 portions of the Work.

§ 4.2.4 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 performing 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 If 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.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract 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.

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

§ 4.2.14 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

§ 5.1 Definitions

§ 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 if 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 Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after 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 (1) 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 Contract 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, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor 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. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 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 termination 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; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the 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 equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner 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 OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 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.

§ 6.1.2 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.

§ 6.1.3 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.

§ 6.1.4 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 Mutual Responsibility

§ 6.2.1 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 operations 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 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 Contractor'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.

§ 6.2.4 The 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 Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for 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:

.1 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 Construction 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;
.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:

.1 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;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or 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 15.

§ 7.3.6 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 Construction 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 TIME

§ 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 Contractor 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 15.1.6.2, 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

§ 9.1.1 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 If 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 may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 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 yet 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 Contract 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 all 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, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 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 9.5.1; 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 Contract 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

§ 9.5.1 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 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 to 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 Work 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 After 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.

§ 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 start-up, 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

§ 9.9.1 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 to by the insurer and authorized by public authorities having jurisdiction over the 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.

§ 9.9.2 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

§ 9.10.1 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 fulfilled.

§ 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 and 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.

§ 9.10.3 If, after 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 Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 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

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

.1 employees on the Work and other persons who may be affected thereby;
.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
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, 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.

§ 10.2.3 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.

§ 10.2.4 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.

§ 10.2.5 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 Contractor 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.

§ 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.

§ 10.4 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 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 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 Contractor 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. The 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.

§ 11.1.3 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.

§ 11.2.2 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.

§ 11.2.3 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 act or 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 it 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, sub-subcontractors, 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 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 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or 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.

§ 11.3.2 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 11.3.1 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.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 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 terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to 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

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it 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.

§ 12.1.2 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.

§ 12.2 Correction of Work

§ 12.2.1 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

§ 12.2.2.1 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.

§ 12.2.2.2 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.

§ 12.2.2.3 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.

§ 12.2.4 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.

§ 12.2.5 Nothing contained in this Section 12.2 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.

§ 13.2 Successors and Assigns

§ 13.2.1 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 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.

§ 13.2.2 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

§ 13.3.1 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.

§ 13.3.2 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

§ 13.4.1 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 Contractor 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.

§ 13.4.2 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 and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, 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, shall be at the Contractor's expense.

§ 13.4.4 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.

§ 13.5 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.

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 Work, 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;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of 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

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, 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 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.

§ 14.1.4 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 performing 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

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 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;~~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:

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

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 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

§ 14.3.1 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.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

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

.1 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 and purchase orders.

§ 14.4.3 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

§ 15.1 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.

§ 15.1.2 Time Limits 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

§ 15.1.3.1 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 21 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.

§ 15.1.3.2 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

§ 15.1.4.1 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.

§ 15.1.4.2 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 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 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

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 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.

§ 15.1.6.2 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 Damages

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

.1 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

§ 15.2.1 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 forth in 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.

§ 15.2.2 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 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 Maker 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.

§ 15.2.7 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.

§ 15.2.8 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

§ 15.3.1 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 stayed 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.

§ 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

§ 15.4.1 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.

§ 15.4.1.1 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.

§ 15.4.3 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

§ 15.4.4.1 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 or 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.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SUPPLEMENTARY CONDITIONS

1.1 GENERAL CONDITIONS:

A. The "General Conditions of the Contract for Construction", AIA Document A201, 2017 Edition, Articles 1 through 15, inclusive, (General Conditions or Conditions of the Contract hereinafter) is a part of this contract, and is incorporated herein as fully as if here set forth.

2.2 SUPPLEMENTS:

A. The following supplements, modify, change, delete or add to the General Conditions. Where any part of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered provisions of that part shall remain in effect.

1. ARTICLE 1 - GENERAL PROVISIONS:

a. Add the following new subparagraph:

"1.5.3 Any written permission given for use of the Drawings, Specifications, and/or other Documents prepared by the Architect and/or the Architect's consultants which is provided under the terms of this Article, shall require and be subject to payment to the Architect for such use, as determined to be equitable by the Architect or as mutually agreed in writing between the Architect and the party or parties requesting and receiving permission for any such use."

b. Add the following new Subparagraphs:

1.6.1 The Architect may, with the concurrence of the Owner, furnish to the Contractor versions of Instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Subparagraph 1.1.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable and/or non-manipulatable electronic operations involving computers.

1.6.2 The Contractor shall not transfer or reuse Instruments of Service in electronic or machine readable form without the prior written consent of the Architect, and payment to the Architect in amount(s) agreeable to the Architect for such use.

1.6.3 Representatives of the Owner, Contractor, and/or Architect shall meet periodically, if required by the Owner or Architect, at mutually agreed-upon intervals for the purpose of establishing procedures to facilitate cooperation, communication and timely responses among the participants. By participating in this arrangement, the parties do not intend to nor will they create additional contractual obligations or modify the legal relationships which may otherwise exist."

2. ARTICLE 2 - OWNER:

a. Refer to Paragraph 2.2.2, and add the following new Subparagraphs:

2.2.2.1 The Contractor shall secure and pay for all necessary permits, fees, etc., as necessary for the execution and completion of the Work of the project, unless specifically indicated otherwise within the Bid and Contract Documents; Which shall include in part, building permit, inspection fees, utility connection fees, utility impact fees, licenses, and other charges which may be applicable and/or due at the time when bids were received or negotiations concluded.

2.2.2.2 Unless specifically indicated otherwise on the Drawings or in the Project Manual, the Owner will furnish all necessary Environmental and Storm Water permits customarily required for this type of project; The Contractor shall comply with the requirements and directions of the Owner and/or imposed on the Owner for compliance with these requirements.

b. Add the following new paragraph:

"2.2.5 The Contractor will make these documents available in electronic format (PDF) for subcontractors to download."

3. ARTICLE 3 - CONTRACTOR:

a. Refer to Paragraph 3.2, and add the following new Subparagraph:

"3.2.5 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination Drawings, or prior Project correspondence and/or documentation."

b. Refer to Paragraph 3.3, and add the following new Subparagraph:

"3.3.4 The Contractor shall lay out their own work. They shall be responsible for all work executed by them under the Contract which shall be constructed to the lines and grades as shown on the Drawings. They shall verify all figures and elevations before proceeding with the work, and will be held responsible for any error resulting from failures to do so."

c. Delete Paragraph 3.4.2, and substitute the following:

"3.4.2 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified, only under the conditions set forth in the General Requirements (Division 1 of Specifications). By making requests for substitutions, the Contractor:

3.4.2.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equivalent to or superior in all respects to that specified;

3.4.2.2 represents that the Contractor will provide at least the same warranty for the substitution that the Contractor would for that specified;

3.4.2.3 certifies that the cost data presented is complete and includes all related costs under this Contract, except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

3.4.2.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects."

d. Add the following new Subparagraph:

"3.4.4 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions, regardless of whether or not the proposed substitution is subsequently accepted by the Owner and/or Architect, and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of such substitutions."

e. Revise the following Subparagraphs:

Before the semicolon at the end of Subparagraph 3.8.2.2, add the following:

", except that if installation is included as part of an allowance in Divisions 1-16 of the Specifications, the installation and labor cost for greater or lesser quantities of Work shall be determined in accordance with Subparagraph 7.3.7, unless specifically indicated otherwise;"

Refer to Subparagraph 3.8.2.2, and add the following after the word "profit":
", temporary storage,"

Refer to Subparagraph 3.8.2.3, and add the following phrase at the end:

", which could not reasonably be anticipated by the Contractor at the time of bidding, and/or which are not due to any cause or delay by the Contractor, and/or which are due to causes over which the Contractor had no control."

f. Refer to Subparagraph 3.9.2, and add the following new Subparagraphs:

"3.9.2.1 Contractor's Superintendent shall be properly qualified and have a minimum of five (5) years experience as superintendent for this Contractor. Contractor shall furnish within five days of their receipt of the Contract, records of proposed Superintendent's education and experience, construction project experience and in what capacities, names of architects for these projects, and

information sufficient to determine suitability for the proposed position for this project.

3.9.2.2 Refer to Division 1 Section "Special Conditions", and individual specifications sections throughout the Project Manual, for additional information and minimum experience requirements."

g. Refer to Subparagraph 3.10.3, and add the following at the end:

"If the project is behind the Construction Schedule, the Contractor shall act on each portion which is not in general accordance with the Construction Schedule, to whatever extent is required to move progress of the Work back into general accordance with the Construction Schedule, at no additional cost to the Owner."

h. Refer to Subparagraph 3.12.7, and change the word "approved" to read "reviewed".

i. Refer to Subparagraphs 3.12.8 and 3.12.9, and revise the following:

Change the word "approved" to read "reviewed", wherever it occurs.

Change the word "approval" to read "review", wherever it occurs.

j. Add the following new Subparagraph:

"3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and ONE (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner, after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum, amounts due to the Architect for evaluation of such additional resubmittals."

k. Refer to Subparagraph 3.15.1, and add the following new Subparagraph:
"3.15.1.1 Remove broken or scratched glass and replace with new glass, remove paint droppings, spots, stains, and dirt from finished surfaces and exposed concrete, masonry, stucco, and similar surfaces, and clean plumbing fixtures, hardware, floors, and equipment. Contractor shall keep interior of the building free of stored or unattended combustible material."

4. ARTICLE 4 - ADMINISTRATION OF THE CONTRACT:

a. Refer to Subparagraph 4.2.7, and revise as follows:

In first sentence, after the word "approve", add "and/or make comments," .

In the last two sentences, change the word "approval", to read "review and/or approval".

b. Refer to Subparagraph 4.2.9, and change the word "inspections", to read "construction observations and final inspection(s)".

5. ARTICLE 5 - SUBCONTRACTORS:

a. Refer to Subparagraph 5.2.1, and add the following new Subparagraph:

"5.2.1.1 Submittal of list as required of the Contractor, shall include all major Subcontractors and Suppliers, and shall be submitted not later than, either along with the Contractor's completed Proposal Form, or shall be submitted to the Owner, with copy to Architect, within 24-hours of the time and date that bids are scheduled to be opened. Refer to Division 1 Section "Special Conditions" for additional information and minimum requirements."

6. ARTICLE 7 - CHANGES IN THE WORK:

a. Refer to paragraph 7.2 Change Orders, and add the following new Subparagraph 7.2.2.

"7.2.2 Change Orders for this project shall have a total of 25% maximum mark-up if sub-contractor and general contractor are involved. Sub-contractor shall have 15% mark-up (10% to cover overhead such as insurance, bond, labor, labor burden, etc. and the remaining 5% for profit). Contractor shall have 10% mark-up (5% to cover all overhead as mentioned above under sub-contractor, and 5% for profit). If the general contractor self-performs the work then they shall be allowed 15% mark-up.

Should changes which will decrease the cost of the work be ordered by the Architect, then the Contract Price shall be reduced by an amount equal to the agreed estimated saving resulting from these changes, and further reduced by the Contractor's and Subcontractor's, if applicable, overhead and profit.

7. ARTICLE 8 - TIME:

a. Refer to Subparagraph 8.1.2, and add the following new Subparagraph:

"8.1.2.1 The date of commencement shall be established as the earlier of either the date the Contractor receives the fully executed Contract, or the date indicated on the Owner's written "Notice To Proceed", unless mutually agreed otherwise and in writing between the Owner and the Contractor."

b. Refer to Subparagraph 8.2.2, and revise as follows:

At end of first sentence, omit the words "and Owner".

8. ARTICLE 9 - PAYMENTS AND COMPLETION:

a. Refer to Subparagraph 9.2, and change the word "Architect", to read "Architect and/or Owner", wherever it occurs.

b. Refer to Subparagraph 9.3.1, and add the following sentence and new Subparagraphs:

"The form of Application of Payment, duly notarized, shall be a current authorized edition of AIA Document G702, or approved equivalent document, supported by a current authorized edition of AIA Document G703 or approved equivalent continuation sheet.

9.3.1.3 Until the Work is **100-percent complete**, the Owner shall pay **95-percent of the first 50-percent** of the amount due the Contractor on account of progress payments, **and no additional retainage thereafter,** except as otherwise provided. Unless for reasons otherwise provided in the Contract Documents, thereafter, there will be no further retainage withheld.

9.3.1.4 Upon completing all requirements to achieve Substantial Completion, as defined within the Contract Documents, the payment shall be sufficient to increase the total payments to **98-percent of the contract sum**, less such amounts as the Architect and/or Owner shall determine for all incomplete work and unsettled claims, except as otherwise provided."

c. Refer to Subparagraph 9.7, and revise as follows:

Change the word "seven", to read "ten", wherever it occurs.

Omit the last nine words, beginning with ", plus…" through the word "Documents".
Add the following Sentence: "In the event it is deemed necessary by the Architect and/or Owner to return a request and/or requests for progress payment to the Contractor, the time limits indicated herein for payment shall begin from the date of receipt of a request for progress payment which is subsequently resubmitted, and found acceptable by the Architect and/or Owner."

d. Refer to Subparagraph 9.8.3, and add the following new Subparagraph:

"9.8.3.1 Except with the consent of the Owner, the Architect will perform no more than one (1) inspection and one (1) reinspection to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections and/or re-inspections due to incomplete work and/or unsettled claims."

e. Refer to Subparagraph 9.8.5, delete the second sentence, and substitute the following:

"Upon such acceptance and consent of surety, if any, the Owner shall make payment sufficient to increase the total payments to 98-percent (98%) of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims."

f. Refer to Subparagraph 9.10.1, and add the following new Subparagraph:

"9.10.1.1 Except with the consent of the Owner, the Architect will perform no more than one (1) inspection and one (1) reinspection to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections and/or re-inspections due to incomplete work, unsettled claims and/or other cause or causes attributable to the responsibilities of the Contractor."

9. ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY:

a. Refer to Subparagraph 10.1, and add the following:

"In performing this work, the Contractor shall in part, take all necessary precautions for ample protection of personnel, property, and equipment from falling debris, dust, or undue exposure to weather. The safety provisions of applicable laws, building and construction codes shall be observed and applicable provisions of the latest edition of the AGC "Manual of Accident Prevention" shall be adhered to and followed. All passageways, guard fences, lights and other facilities required for protection of the public and workmen shall be provided and maintained."

10. ARTICLE 11 - INSURANCE AND BONDS:

a. Delete Paragraphs 11.2, 11.3, and 11.4, and replace with the following:

"11.2 CONTRACTOR'S AND SUBCONTRACTOR'S MINIMUM LIABILITY INSURANCE:

11.2.1 The insurance required by Subparagraph 11.1 shall be written for not less than the following minimum limits of liability, or greater if required by law. **Additionally named primary insureds shall be *"the Owner, Architect, and their Consultants",* except not on Worker's Compensation; all insurance certificates shall provide for "Waiver of Subrogation" against *"the Owner, Architect, and their Consultants",* by the Contractor, each Subcontractor, and their insurers.** Refer also to Division 1 Section "Special Conditions", for additional information and requirements.

11.2.2 **MINIMUM COVERAGE(S) REQUIRED:**

11.2.2.1 Workers' Compensation:

a.	State	Statutory
b.	Applicable Federal	Statutory
c.	Employer's Liability	$1,000,000
d.	Benefits Required by Union Labor Requirements	As applicable.
e.	Voluntary Compensation	$1,000,000

f. Broad Form all states Endorsement.

11.2.2.2 Comprehensive General Liability:

a. Including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage; Contractual Liability; Personal Injury; all as combined single limits:

1) General Aggregate: $2,000,000, with general aggregate of $2,000,000 applicable to this project only; including in part, Bodily Injury/Property Damage $2,000,000 each occurrence.

2) Products/Completed Operations: $2,000,000 annual aggregate.

Products and Completed Operations Insurance shall be maintained for three (3) years after the work has been completed; property damage liability insurance shall provide X, C, and U coverage; Fellow Employee suits shall be included.

3) Personal and Advertising Injury: $1,000,000 per occurrence.

4) Each Occurrence: $1,000,000.

11.2.2.3 Comprehensive Commercial Business Automobile Liability (owned, non-owned, hired):

a. Combined single limits for bodily injury and property damage:

1) Bodily Injury/Property Damage $1,000,000 each occurrence.

11.2.2.4 Aircraft Liability (owned and non-owned) when applicable:

a. Furnish proof of coverage with the following limits (combined single limits for bodily injury and property damage):

1) Admitted liability $1,000,000 per seat.

2) Bodily Injury/Property damage $1,000,000 each occurrence.

11.2.2.5 Commercial Umbrella Excess Liability over Primary Insurance:

a. $4,000,000 each occurrence.
b. Products/Completed Operations: $4,000,000 aggregate.

c. General Aggregate: $4,000,000.

11.2.2.6 Indemnity:

a. The Contractor shall assume all liability for and shall indemnify and save harmless the Owners, Architect, and their consultants and employees from: All damages and liability for injury to any person or persons, and injury to or destruction of property, including the loss of use thereof, by reason of an accident or occurrence arising from operations under the Contract, whether such operations be by himself, or by any subcontractor or by anyone directly or indirectly employed by either of them, occurring on or about the premises or the ways and means immediately adjacent, during the term of the contract, or any extension thereof, and shall also assume the liability for injury and/or damages to adjacent or neighboring property by reason of work done under this Contract; The obligations of the work done under this Contract. The obligations of the contractor under this paragraph shall not extend to the liability of the Architect, his agents or employees arising out of:

1) The preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, design or specifications, or;

2) The giving or the failure to give directions or instructions by the Architect, his agents or employees, upon request, provided such giving of or failure to give is the primary cause of the injury or damage.

The insurance shall extend to and include all of the contractor's operations, regardless of whether they may be in connection with work that is temporary, permanent, included in any of the bid items or classified as extra work.

A statement of the above indemnity coverage and condition shall be included on the Insurance Certificate or Policy.

11.2.2.7 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to signing of the Contract for the Work of this project, and along with the required 100% Performance and 100% Payment Bonds (100% of Contract amount), shall be attached to the Contract(s). These certificates shall contain a provision that policy coverage will not be changed or canceled until at least thirty (30) days prior written notice has been given the Owner and Architect, which may be reduced to at least ten (10) days for non-payment of premium only.

a. Provide copies of policies renewed, altered and/or replaced during the Work of this project, to the Owner within 10-days of their effective date(s), with copy sent to the Architect.

11.3 PROPERTY INSURANCE:

11.3.1 The Contractor shall provide an All Risk ("open perils") Builder's Risk Policy with a replacement cost valuation, to cover the interests of all contractor's and sub-contractors of any tier. The contractor and subcontractors of any tier shall be responsible for all risks of physical loss to the work not otherwise covered, including in part, portions of the work stored off the site and in transit between off site storage and site.

11.3.2 The total amount of the insurance shall be the amount of the contract.

11.3.3 The policy or policies shall be endorsed to waive all rights of subrogation among, between, and to each insured under the policy.

11.3.4 The "Owner, Architect, and their Consultants" shall be additionally named primary insureds under the policy or policies. Refer also to Division 1 Section "Special Conditions", for additional information and requirements.

11.3.5 Any deductibles will be apportioned to the named insureds (but excluding those named in 11.3.4) as their interests may appear, based upon claim payments.

11.3.6 Any claims coming under the terms and conditions of the policies shall be immediately reported by written notice to the Architect, with a copy to the Owner:

Goodwyn, Mills & Cawood, Inc.
2701 First Avenue South, Suite 100
Birmingham, Alabama 35233
Phone: (205) 879-4462

11.4 PERFORMANCE AND PAYMENT BOND:

11.4.1 The Contractor and subcontractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source, and the cost thereof shall be included in the Bid and Contract Sum. The amount of each bond shall be equal to 100-percent (100%) of the Contract Sum.

11.4.1.1 The Contractor shall deliver the required bonds to the construction manager attached to each copy of the Contract which the Contractor is presented to execute for the Work of the Project.

11.4.1.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power of Attorney."

11. ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK:

a. Refer to Subparagraph 12.2.2, and add the following new Subparagraphs:

"12.2.2.1.1 For the purposes of this paragraph, "reasonable time" shall be defined as within ten (10) consecutive calendar days from and after receipt of notice from the Owner and/or Architect."

"12.2.2.4 Upon request by the Owner, and prior to the expiration of the expiration of one year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance."

12. ARTICLE 15 - CLAIMS AND DISPUTES

a. Refer to Subparagraph 15.1.5, and add the following new Subparagraphs:

"15.1.5.1 Claims for increase in the Contract Time shall set forth in detail circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work, and the number of normal working days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require, including where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

15.1.5.2 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

15.1.5.3 Refer to Division 1 Section "Special Conditions" and other applicable portions of the Bid and Contract Documents for additional information, requirements, reporting requirements, limitations and exclusions relating to claims for additional time."

END OF SUPPLEMENTARY CONDITIONS

Goodwyn Mills Cawood

2400 5th Avenue South
Suite 200
Birmingham, AL 35233

T (205) 879-4462

www.gmcnetwork.com

Special Provisions of the Contract Documents:
Add the following:

Under no circumstance will GMC provide hard copy sets of drawings, project manuals, or other contract documents. Upon request from bidders, GMC will provide electronic (PDF) sets of drawings and project manuals prior to award of contract. Upon award of contract, the General Contractor may request digital sheet files using the Electronic File and Transfer Agreement Form and its appropriate procedures and fees.

Goodwyn Mills Cawood

2400 5th Avenue South
Suite 200
Birmingham, AL 35233

T (205) 879-4462

www.gmcnetwork.com

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 below.

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 Alyssa Martin at (205) 879-4462 with any questions.

GOODWYN MILLS CAWOOD, LLC.

PROJECT

Project Name:

Project No.:

Document Issue Date:

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.

FEE STRUCTURE: Prior to conversion of files, GMC must receive this complete Electronic File Conversion and Transfer Agreement, completed in full, and executed by a representative of the User with authorization to enter into contracts on behalf of the User.

			PER SHEET FEE
Civil	C		$125
Architecture	A		$150
Structural	S		$125
Mechanical	M, P, FP		$125
Electrical	E		$125
Acoustical & AV	AV		$125
Other	G, FS, etc.		$100

USER ACCEPTANCE OF AGREEMENT

Company Name: _____

By: _____ Date: _____

Its: _____

REQUESTED FILE FORMAT

User (Select ONE)	File Format
☐	Bound Auto CAD Release 2007
☐	Bound Auto CAD Release 2010
☐	Bound Auto CAD Release 2013
☐	Bound Auto CAD Release 2018

SCHEDULE OF REQUESTED FILES (To be filled by User)

SHEET		INTENDED USE		FEE	
No.	Name				

(PRINT ADDITIONAL FORMS AS REQUIRED)

APPLICATION AND CERTIFICATE FOR PAYMENT FORM

1.1 Application for Payment shall be executed on AIA Document G702 Contractor's Application for Payment, along with AIA Document G703 Continuation Sheet. A draft copy is attached for reference. Copies of G702 and G703 are available for viewing in the office of the Architect, and may be purchased from an AIA documents vendor by the Contractor.

END OF APPLICATION AND CERTIFICATE FOR PAYMENT FORM

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:		PROJECT: .	APPLICATION NO:	001	Distribution to:
			PERIOD TO:		OWNER: ☐
			CONTRACT FOR:	General Construction	ARCHITECT: ☐
FROM CONTRACTOR:		VIA ARCHITECT:	CONTRACT DATE:		CONTRACTOR: ☐
			PROJECT NOS:	/ /	FIELD: ☐
					: ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM			$0.00
2. NET CHANGE BY CHANGE ORDERS			$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)			$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)			$0.00
5. RETAINAGE:			
a. 0 % of Completed Work (Column D + E on G703:	$0.00	)= $0.00	
b. 0 % of Stored Material (Column F on G703:	$0.00	)= $0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)			$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)			$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)			$0.00
8. CURRENT PAYMENT DUE			$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)		$0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document, G702™–1992, Application and Certification for Payment, or G736™–2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:	001
APPLICATION DATE:	
PERIOD TO:	
ARCHITECT'S PROJECT NO:	

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	BALANCE TO FINISH (C – G)	RETAINAGE (IF VARIABLE RATE)
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00%**	**0.00**	**0.00**

PROGRESS SCHEDULE AND REPORT

CONTRACTOR:

DATE OF REPORT:

PROJECT: RAINBOW CITY RECREATION CENTER
RAINBOW CITY, ALABAMA

PROCEED DATE:

ARCHITECT: GOODWYN MILLS CAWOOD, LLC.
2400 5TH Ave., S., Suite 200
Birmingham, Alabama 35233

PROJECT NO.: ABHM230021

PROJECTED COMPLETION DATE:

WORK DIVISION	%	AMOUNT													≥ MONTH
1. GENERAL REQUIREMENTS															
2. SITEWORK															
3. CONCRETE															
4. MASONRY															
5. METALS															
6. WOOD AND PLASTICS															---100%
7. THERMAL AND MOISTURE PROTECTION															-----90%
8. DOORS AND WINDOWS															-----80%
9. FINISHES															-----70%
10. SPECIALTIES															-----60%
11. EQUIPMENT															-----50%
12. FURNISHINGS															-----40%
13. SPECIAL CONSTRUCTION															-----30%
14. CONVEYING SYSTEMS															-----20%
15. MECHANICAL															-----10%
16. ELECTRICAL															------0%
TOTAL ORIGINAL CONTRACT	100%														
ANTICIPATED DRAW IN $1,000's															
ACTUAL DRAW IN $1,000's															

LEGEND: **ANTICIPATED ACTIVITY** **ACTUAL ACTIVITY** **ANTICIPATED CASH FLOW** **ACTUAL CASH FLOW**

USE ADDITIONAL SHEET IF JOB IS SCHEDULED MORE THAN 12 MONTHS

-INVENTORY OF STORED MATERIALS

Project: **RAINBOW CITY RECREATION CENTER**
RAINBOW CITY, AL

For Estimate No. _____

For Period Ending _____

Contractor:

GM&C Project No. ABHM230021

A	B	C	D	E	F
DESCRIPTION	MATERIALS STORED LAST PERIOD	PURCHASED THIS PERIOD	TOTAL COLUMNS B + C	MATERIALS USED THIS PERIOD	MATERIALS PRESENTLY STORED

To be used as documentation to support value of Stored Materials reported on APPLICATION AND CERTIFICATE FOR PAYMENT.

CHANGE ORDER FORM

1.1 Changes to the Contract shall be made using AIA Document G701 Change Order. A draft copy is attached for reference. Copies of G701 are available for viewing in the office of the Architect, and may be purchased from an AIA documents vendor by the Contractor.

END OF CHANGE ORDER FORM

DRAFT

AIA® Document G701™ – 2017

Change Order

PROJECT: *(Name and address)*	CONTRACT INFORMATION: Contract For: Date:	CHANGE ORDER INFORMATION: Change Order Number: Date:
OWNER: *(Name and address)*	ARCHITECT: *(Name and address)*	CONTRACTOR: *(Name and address)*

THE CONTRACT IS CHANGED AS FOLLOWS:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was	$	0.00
The net change by previously authorized Change Orders	$	0.00
The Contract Sum prior to this Change Order was	$	0.00
The Contract Sum will be increased by this Change Order in the amount of	$	0.00
The new Contract Sum including this Change Order will be	$	0.00

The Contract Time will be increased by Zero (0) days.
The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT *(Firm name)*	CONTRACTOR *(Firm name)*	OWNER *(Firm name)*
SIGNATURE	SIGNATURE	SIGNATURE
PRINTED NAME AND TITLE	PRINTED NAME AND TITLE	PRINTED NAME AND TITLE
DATE	DATE	DATE

CERTIFICATE OF SUBSTANTIAL COMPLETION FORM

1.1 Certificate of Substantial Completion shall be executed using AIA Document G704 Certificate of Substantial Completion. A draft copy is attached for reference. Copies of G704 are available for viewing in the office of the Architect, and may be purchased from an AIA documents vendor by the Contractor.

END OF CERTIFICATE OF SUBSTANTIAL COMPLETION FORM

DRAFT

AIA® Document G704™ – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)*	CONTRACT INFORMATION: Contract For: Date:	CERTIFICATE INFORMATION: Certificate Number: Date:
OWNER: *(name and address)*	ARCHITECT: *(name and address)*	CONTRACTOR: *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.
(Identify the Work, or portion thereof, that is substantially complete.)

ARCHITECT *(Firm Name)*	SIGNATURE	PRINTED NAME AND TITLE	DATE OF SUBSTANTIAL COMPLETION

WARRANTIES
The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:
(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED
A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:
(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first.
The Contractor will complete or correct the Work on the list of items attached hereto within ( ) days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: $

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*	SIGNATURE	PRINTED NAME AND TITLE	DATE
OWNER *(Firm Name)*	SIGNATURE	PRINTED NAME AND TITLE	DATE

ADVERTISEMENT FOR COMPLETION FORM

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given that

_____,
(*Name of Contractor*)

has completed the Contract for Construction of

_____
(*Name of Project*)

_____
(*Insert location data in County or City*)

for the _____,Owner(s), and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify

GOODWYN, MILLS AND CAWOOD, INC.
2701 1st Avenue South, Suite 100
Birmingham, Alabama 35233
(*Architect*)

_____
(*Name of Contractor*)

_____
(*Business Address*)

_____

NOTE: This notice must be run once a week for four successive weeks in the County where the project is located for projects exceeding $50,000.00. For projects of less than $50,000.00, run one time only. Proof of publication is required, by submittal of certified ad copy in duplicate.

SECTION 00 3100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:
   1. Site and Utility Survey: The site survey of existing conditions of the site is included in the Civil drawings.
   2. Geotechnical Report: The Geotechnical Report is included in these Specifications following this Section.

1.02 PERMITS

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

3.01 OBTAINMENT OF PERMITS

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

END OF SECTION

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SECTION 00 3100
AVAILABLE PROJECT INFORMATION

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      a. Submit application within five days of the Notice to Proceed.
   2. Pay required fees.
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   4. Do not commence execution of any item of work for which a permit has not been obtained.

END OF SECTION

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Rainbow City Rec Center

RAINBOW CITY, ETOWAH COUNTY, ALABAMA

October 20, 2023

REPORT OF GEOTECHNICAL EXPLORATION

Prepared By

Goodwyn Mills Cawood, LLC
2400 5TH Avenue S, Suite 200
Birmingham, AL 35233
T 205.879.4462
www.gmcnetwork.com

GMC PROJECT NUMBER: GBHM230043

Goodwyn Mills Cawood

2400 5th Avenue South
Suite 200
Birmingham, AL 35233

T (205) 879-4462

www.gmcnetwork.com

October 20, 2023

Mayor Joe Taylor
City of Rainbow City
3700 Rainbow Drive
Rainbow City, Alabama 35906

RE: REPORT OF GEOTECHNICAL EXPLORATION
PROPOSED RAINBOW CITY REC CENTER
RAINBOW CITY, ETOWAH COUNTY, ALABAMA
GMC PROJECT GBHM230043

Honorable Mayor Taylor,

Goodwyn Mills Cawood, LLC (Geotechnical & Construction Services Division) is pleased to provide this report of geotechnical exploration performed for the above referenced project. This report includes the results of field and laboratory testing and general recommendations for foundation design and site recommendations.

We appreciate the opportunity to perform this study during this phase of the project for you and look forward to continued participation during the construction phase of this project. If you have any questions pertaining to this report, or if we may be of further service, please do not hesitate to call.

Sincerely,
GOODWYN MILLS CAWOOD, LLC

Kevin W. Wales, PE
Executive Vice President
Licensed Alabama 20146

Michael J. McNeill, PE
Vice President, Geotechnical Engineer
Licensed Alabama 26331

GMC

TABLE OF CONTENTS **Page**

1.0 EXECUTIVE SUMMARY

The summary of conclusions and recommendations contained in this section of the report are provided for your convenience. A geotechnical exploration has been conducted for the proposed Rainbow City Rec Center site in Rainbow City, Etowah County, Alabama. We understand that the proposed Rec Center will be approximately 27,000 SF with a gymnasium, locker rooms, maintenance rooms, an outdoor pool, and associated parking and drives. We have not been provided any structural information about the planned rec center building or any proposed grades. We anticipate that the grades in the proposed building area will be raised less than 4 feet. We anticipate column and wall loads of up to 150-kips and 8-kips per foot, respectively.

Eighteen (18) soil test borings were drilled across the site. Eight (8) borings were drilled in the proposed building area to a depth of 25 feet each or auger refusal, whichever occurred first. The remaining borings were drilled to depths of 10 feet each or refusal. The borings generally encountered moderate to highly plastic clay (USCS Soil Classification CL and CH). The borings encountered auger refusal in the proposed building area at depths of 9.5 to 18 feet below the existing ground surface. The remaining borings encountered auger refusal or boring termination at depths of 6 to 10 feet. Groundwater was encountered at an approximate EL 548 feet, near the interface of the bedrock.

In general, the upper 1.5 to 3 feet of soil across the site was classified as lean clay (CL). The upper soils were underlain by moderately to highly plastic (fat) clay (CH). Fat clays (CH) have the potential to shrink and swell with changes in moisture content. **We recommend that grading activities in the base bid be set up to provide 12-inches of low plasticity soils below the building and paved areas subgrade elevation. In addition, we recommend that an allowance be set up for the undercut/replacement of soils below the 12-inch requirement for unforeseen conditions or time of the year grading activities (wet season).**

Based on our experience, we anticipate that conventional shallow foundations can be used and should be sized for a net allowable bearing capacity of 2,500 pounds per square foot (psf). The foundations should bear at a minimum depth of 24 inches below the proposed final exterior grade. We anticipate total and differential settlements of up to 1-inch and ½-inch, respectively.

2.0 PROJECT INFORMATION AND SCOPE OF WORK

2.1 Project Information

The proposed property is located near the intersection of Lumley Road and School Drive in Rainbow City, Etowah County, Alabama. The site currently has low-lying grasses with trees along the east, north, west property lines. The site is west of the existing Rainbow City Middle School on the north side of Lumley Road.

We understand that the proposed Rec Center will be approximately 27,000 SF with a gymnasium, locker rooms, maintenance rooms, an outdoor pool, and associated parking and drives. We anticipate that the facility will be CMU construction. We have not been provided any structural information about the planned rec center building or any proposed grades. We anticipate that the grades in the proposed building area will be raised less than 4 feet. We anticipate column and wall loads of up to 150-kips and 8-kips per foot, respectively.

2.2 Scope of Work

The purpose of this exploration was to perform a general evaluation of the subsurface soil conditions at the site and to provide sitework recommendations, pavement recommendations, and foundation recommendations. The scope of the exploration and evaluation included field and laboratory testing and an engineering evaluation of the materials encountered.

Eighteen (18) soil test borings were drilled across the site. Eight (8) borings were drilled in the proposed building area to a depth of 25 feet each or auger refusal, whichever occurred first. The remaining borings were drilled to depths of 10 feet each or refusal. The borings were advanced to the planned termination depth or to auger refusal to soil drilling methods. Split-spoon sampling and standard penetration testing were performed at standard intervals in the borings. Groundwater levels were recorded in the borings at the time of drilling. Each borehole was backfilled with soil cuttings from the drilling process upon completion.

The scope of services for the geotechnical study did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring records regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 General

At the time of this study, the site had low-lying grasses with a gentle slope from the high elevation of EL 580 feet at the southwest corner to a low of EL 556 feet at the northeast corner. The proposed location of the building pad is relatively level with an average elevation of EL 562 feet. The following pictures show the site conditions at the time of our exploration:

View from the Southwest Corner towards the Northeast

View of the Southwest Corner from the Proposed Building Area

3.2 Field Exploration

The boring locations and depths were selected by GMC personnel. Field-testing employed by GMC was performed in general accordance with ASTM standards or generally accepted methods.

The borings were performed on September 11 and 12, 2023 using an ATV-mounted drill rig equipped with a rotary head and hollow stem augers (HSA). Soils were sampled using a two-inch OD split barrel sampler in accordance with ASTM D1586 driven with an automatic hammer.

3.3 Site Geology

Published geologic information indicates the site is underlain by the Conasauga geologic formation. Published geologic information indicate that the site is underlain by the Conasauga Formation. The Conasauga geologic formation consist of medium-bluish-gray, fine-grained, thin to medium-bedded limestone and interbedded dark-gray shale in varying proportions. The limestone weathers to a clayey or silty-clay soil that ranges from 5 to 20 feet in thickness. The bedrock surface is highly irregular, and pinnacles may project to the surface and limestone boulders and fragments occur throughout the soil zone.

3.4 Sinkhole Risk

Since the Conasauga Formation is primarily carbonate rock, it is susceptible to dissolution from the groundwater as it moves through joints and fissures in the rock formation. As dissolution progresses, cavities begin to form within the rock mass and the overlying residual soil can be eroded downward into the slots, therefore forming sinkholes in the overburden soils. Sinkholes can form spontaneously and are extremely difficult to predict. Sinkhole activity can be influenced by many factors, including both on-site and off-site activities.

Since the movement of water through the soil and bedrock can influence the dissolution process, site grading should be designed to minimize the surface water infiltration. It should be noted that in the developing the site, there is a risk of future sinkhole development, however taking precaution during development can reduce the potential. However, the level of these risks cannot be defined since they are partially controlled by nature. To minimize the potential, we recommend that water be diverted away from structures and collected in catch basins, construct drainage swales away from structures and roads, provide positive drainage away from structures, minimize or do not install irrigation systems, and use the on-site clays for bedding material. With these precautions, it is our opinion that the site will have no greater risk of subsidence than the nearby developments overlying similar geologic conditions. Our geologic publication and map review indicates there are documented sinkholes within five miles of this site. However, the borings did not encounter any voids or evidence of current sinkhole activity on this site within the depths explored.

Similar types of construction have been successfully developed in this area. This site poses no more sinkhole risk than adjacent developments.

3.5 Subsurface Conditions

The site was explored by drilling eighteen (18) soil test borings across the site. The building borings (B-01 through B-08) were planned to be drilled to a depth of 25 feet below the existing grade and the remaining borings were planned to be drilled to a depth of 10 feet below the existing grade. Auger refusal was encountered in eleven (11) of the borings at the depths shown below:

Boring	Auger Refusal Depth (feet, below existing grade)*	Boring	Auger Refusal Depth (feet, below existing grade)*
B-01	18	B-10	10.5 (BT)
B-02	13	B-11	10.5 (BT)
B-03	9.5	B-12	6
B-04	13	B-13	10
B-05	13	B-14	10.5 (BT)
B-06	13	B-15	10.5 (BT)
B-07	14.2	B-16	10.5 (BT)
B-08	13	B-17	10.5 (BT)
B-09	9	B-18	10.5 (BT)

*BT = Boring Termination

The following summarizes the subsurface conditions encountered:

Ground Cover

Surficial ground cover consisted of organic laden material (OLM) to depths of about 1 to 3 inches. Thicker areas may be encountered in the lower lying areas of the site.

Residuum

Residual soils, weathered from the underlying shale and limestone bedrock, consisted of soft to hard lean and fat clay (CL and CH) and loose to dense clayey sand (SC) underlain by stiff to hard fat clay (CH) to the boring termination or refusal depths. Standard Penetration Test (SPT) N-values in these materials ranged from 4 to 50 blows per foot (bpf).

The subsurface descriptions contained herein are of a generalized nature to highlight the major soil stratification features and soil characteristics. The boring records included in the Appendix should be reviewed for specific information as to individual boring locations. The stratification shown on the boring records represents conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials, and the transition may be gradual.

3.6 Groundwater Information

Groundwater was only encountered in borings B-01 and B-09 at depths of 15 feet and 9 feet, respectively, at the time of drilling. The borings were backfilled prior to leaving the site for safety reasons and therefore no long-term groundwater levels were recorded. It is important to note that the groundwater levels may not have stabilized in the borings. Furthermore, groundwater levels may vary due to seasonal conditions, proximity to bodies of water, and recent rainfall. The borings were drilled during a lengthy period of dry weather in this area.

3.7 Laboratory Testing

The laboratory-testing program included visual classification of all soil samples by a geotechnical professional. Laboratory tests were performed on selected samples including moisture content, grain size, and Atterberg limits tests. The laboratory-testing program was conducted in general accordance with applicable ASTM standards and the results are indicated on the Boring Records and summarized in the Appendix.

4.0 SITEWORK RECOMMENDATIONS

4.1 General

In general, the upper 1.5 to 3 feet of soil across the site was classified as lean clay (CL). The upper soils were underlain by moderately to highly plastic (fat) clay (CH). Fat clays (CH) have the potential to shrink and swell with changes in moisture content. **We recommend that grading activities in the base bid be set up to provide 12-inches of low plasticity soils below the building and paved areas subgrade elevation. In addition, we recommend that an allowance be set up for the undercut/replacement of soils below the 12-inch requirement for unforeseen conditions or time of the year grading activities (wet season).**

4.2 Sitework Recommendations

Clearing and Stripping

Sitework should begin with clearing and grubbing of the site and should include the removal of the removal of the organic laden material (OLM).

Surface Soils

Soft soils were encountered in the upper 1 to 2 feet in various areas across the site. We recommend that all areas be proofrolled prior fill placement.

Expansive/Fat Clays

Fat clay (CH) encountered in the borings below 1 to 3 feet. Such fat clays have the potential to shrink and swell with a corresponding loss or gain in soil moisture which can result in subsidence or heave of floor slabs, foundations, and pavements. If these soils are encountered near the surface in other areas, to reduce this volume change potential, we recommend that the fat clays be "capped" with low plasticity compacted fill meeting the requirements in Section 4.4 of this report. A minimum cap thickness of 12 inches is recommended in areas such as pavements.

Proofrolling

Once the site is at grade and prior to the placement of any new fill, the areas should be proofrolled with repeated passes of a loaded tandem axle dump truck to locate deeper soft soils. Soils that are observed to rut or deflect excessively under the moving load should be undercut and replaced with properly compacted fill. The proofrolling, undercutting, and filling activities should be witnessed by a qualified representative of the geotechnical engineer and should be performed during a period of dry weather.

Attempts can first be made to compact the problem soils. If dry weather conditions exist prior to and at the time of construction, re-compaction and densification may prove successful. The soils should be scarified and the soil moisture should be adjusted to within 3 percent of optimum moisture for low plasticity soils. Once proofrolling has been accomplished, then re-compaction of the soils may be attempted. In pavement areas where unsuitable soils are encountered, stabilization using geotextile or geogrid with stone may be a more economical option than removal and replacement of the soils.

4.3 Time of Year Site Preparation Considerations

The time of the year that the sitework begins can affect the project considerably. In this area, the "wet" season is generally between the months of November to April, and the "dry" season from May to October. There are many considerations that need to be addressed prior to bidding a project that could affect the budget based on the time of year a project starts earthwork activities. The time of the year that the geotechnical borings were performed can provide a false sense of actual near surface conditions depending on the time of year and weather conditions. Below are considerations that should be addressed based on the time of the year earthwork is started.

"Wet" Season

During the "wet" season, the amount of undercutting may be greater, therefore resulting in greater excavation costs. The soils are typically proofrolled to determine their suitability for the placement of new fill or subgrade support. During the wet season, the surface soils have a higher moisture content and will tend to pump, therefore, hindering the placement of new fill. In addition, the drying time, time period between rain events, and temperature is not conducive to scarify soils, allow to dry, and recompact. At this time, the decision should be made by the owner to try either scarify/dry/compact the in-place soils, which could take time, or undercut and replace with suitable material, which could increase the sitework costs. Based on our experience, the amount of undercut could be an additional 1 to 2 feet (or greater in localized areas), whereas in drier weather, lesser amounts of undercutting may be necessary, if recompaction or stabilization of soils left in place can be achieved.

Some undercut soils are not always "unsuitable" soil and can be moisture conditioned and reused as fill in the deep areas, if drying conditions are favorable.

"Dry" Season

During the "dry" season, the surface soils have a lower moisture content and will tend to "bridge" or "crust" softer underlying soils. They will generally allow the placement of new fill, but the crust can break down if repeated passes with heavily loaded equipment is persistent. In addition, new fill from cuts or other sources may need to be moisture conditioned prior to compaction. The soils can dry significantly, requiring the addition of water for proper compaction. Water trucks should be used, as necessary, by the contractor to condition the soils within the required specifications.

Contractor Responsibility

The grading contractors have the option of performing their own evaluation of the site conditions to assess the excavation considerations based on the time of year a project is bid. We strongly suggest that the grading contractors conduct their own exploration and evaluation of the site conditions and material management requirements to cost effectively develop the site.

Typically, due to the movement of heavy equipment and weather conditions, the subgrade becomes disturbed during construction. As a result, fine grained clayey soils have a tendency to lose shear strength and support capability. Therefore, additional effort on the Contractor's part will be required to reduce traffic and limit disturbance of soils. It is essential that the subgrade be restored to a properly compacted condition based on optimum moisture and density requirements. Restoration of the subgrade should be addressed in the project specifications.

4.4 Fill Placement

Soil Fill Material

Soil fill material in structural and paving areas should be placed in loose lifts not exceeding 8-inches in thickness with a maximum particle size of 3 inches. The following table summarizes the compacted fill requirements:

Location	Test Method	Compaction Required (minimum)	Moisture Content
Structural and Pavement Areas and 10' beyond perimeter	ASTM D698 (standard)	98 %	-/+3 percentage points of optimum moisture

Structural fill material should meet the following characteristics:

Property	Requirement
Organic Material	≤ 5%
Liquid Limit	‹ 50%
Plasticity Index	≤ 30%
Maximum Dry Density	≥ 95 lb/ft^3
Maximum Particle Size	3 inches or less

Samples of the proposed fill materials, either from on-site or borrow, should be provided to the geotechnical engineer for Proctor testing and evaluation prior to placement. Density tests should be performed to document compaction and moisture content of any earthwork involving soils and other applicable materials. Density tests should be performed frequently, with a recommended minimum of one test per 5,000 square feet per lift of fill in

structural areas and one test per 10,000 square feet per lift in other areas. Fill material must meet the specified density and moisture requirements to be considered acceptable.

4.5 Backfilling of Utility Trenches

Backfilling of storm drain and utility trenches must be performed in a controlled manner to reduce settlement of the fill and cracking of overlying floor slabs and pavements. We recommend that utility trenches be backfilled with acceptable borrow or dense-graded crushed stone in 6-inch loose lifts compacted with mechanical piston tampers to the project requirements. Should seepage occur in utility trenches, it may be necessary to "floor" the trench with dense-graded gravel to provide a working surface. If crushed stone is used to backfill utility trenches, we recommend that dense graded aggregate (DGA, compacted in lifts) be used. Open-graded crushed stone, such as ALDOT #57, can serve as a channel for seepage toward structures and therefore is not recommended for use as utility trench backfill.

4.6 Excavation Characteristics of On-Site Materials

Some excavation of the materials onsite may require the use of a large dozer (D8 or larger) equipped with a single-shank ripper or a hydraulic ram. Utility installations that require deeper excavation may encounter more resistant material that will likely require blasting or other means to efficiently remove the rock. We would anticipate material below our auger refusal depths will require additional effort to excavate. In confined excavations, a hydraulic ram, blasting, or other means may be required.

5.0 STRUCTURAL RECOMMENDATIONS

5.1 Shallow Foundations

We have not been provided with any structural loads or a conceptual design of the building. Based on our experience, we do not anticipate column and wall loads to exceed 150-kips and 8-kips per foot, respectively. Conventional shallow foundations can be used and should be sized for a net allowable bearing capacity of 2,500 pounds per square foot (psf). If higher loads are anticipated, additional analysis should be performed. The foundations should bear at a minimum depth of 24 inches below the proposed final exterior grade. Total and differential settlements of up to 1-inch and ½-inch, respectively, should be expected.

Even though computed footing dimensions may be less, column footings and continuous footings should have minimum width dimensions of 24 inches and 18 inches, respectively. This allows for hand cleaning of materials disturbed during the excavation process and reduces the potential for punching shear failure.

Foundation concrete should be placed the same day as footings are excavated so that the foundation bearing soils can remain near the existing moisture content. Foundation bearing surfaces should not be disturbed or left exposed during inclement weather. Saturation of the on-site soils can cause a loss of strength and increased compressibility. If bearing soils dry excessively, the can later well and heave foundations. Excavations for footings should be hand cleaned to remove loose soil or mud and the bearing surface should be thoroughly compacted. If concrete placement is not possible immediately after excavation, we recommend that a thin layer (approximately 2 inches) of lean concrete or CLSM be placed on the bearing surface for protection after we have observed and evaluated the exposed bearing surfaces.

All foundation excavations should be observed by the geotechnical engineer or his representative. The engineer can provide geotechnical guidance to the owner's design team should any unforeseen foundation problems develop during construction. If areas of foundation surfaces prove to be unsuitable, the foundation may need to be over-excavated. The over-excavated area can be backfilled with "lean" concrete, controlled low strength material (CLSM), or well-compacted dense graded crushed stone (ALDOT 825B) up to the planned foundation bearing depth.

5.2 Floor Slabs

It is our opinion that floor slabs can be built on-grade achieving support from 12-inches of properly compacted fill material. Ground supported slabs should be founded on a minimum of 4 inches of compacted, granular materials such as crushed stone or a clean sand with less than 10% passing the #200 sieve. This layer should provide uniform and immediate support of the slab and act as a capillary break. A vapor retarder should be used on top of the granular layer, as required by the building use.

Care should be taken so that fines from the subgrade are not allowed to contaminate the granular layer. If fines do contaminate this layer, capillary rise and subsequent damage to moisture sensitive floor coverings could occur. On most projects, there is some time lag between initial grading and the time when the contractor is ready to place concrete for the slab-on-grade. Inclement weather just prior to placement of concrete for the slab-on-grade can result in trapped water in the granular layer.

5.3 Below Grade Walls and Swimming Pool

Below grade walls and the swimming pool must be designed to resist the lateral earth pressures that will be induced by the weight of the backfill materials, hydrostatic pressures on the walls, and any adjacent slab or foundation surcharge loads exerted on the walls. The borings were drilled during a period of dryer weather and the groundwater level at the time of drilling in borings B-01 and B-09 was at approximate EL 548 feet. The swimming pool may need to be designed to withstand buoyance if the swimming pool will be empty at any time after construction. It is recommended that the walls be supported as outlined above and backfilled with a free draining material such as crushed stone/gravel or clean sand (less than 10% passing a No. 200 sieve). Positive drainage should be provided at the base of the walls to remove groundwater or seepage and to prevent an increase in hydrostatic pressures. A drainage system should be provided near or at the base of the walls to collect and remove groundwater and to prevent buildup of hydrostatic pressures unless the structures are designed to resist the hydrostatic pressures for the full structure depth that is below ground.

Walls that need to restrict horizontal movement at the top should be designed for "at rest" earth pressure conditions. Walls that are free to deflect should be designed for "active" earth pressure conditions. The "passive" earth pressure state should be used for soils supporting the retaining structure, such as toe backfill. Fine-grained materials should not be used as backfill directly behind walls. Free-draining crushed stone or gravel or sand should be used as backfill. The table below presents recommended values of earth pressure coefficients for these backfill materials:

Backfill Properties

Soil Parameter	Backfill Type		
	SM, SC	SP, SW	GW, GP
Soil Unit Weight (pcf)	115	120	95
Buoyant unit Weight (pcf)	53	58	33
Angle of Internal Friction, Φ, deg	32	34	38
At rest Pressure Coefficient, K_o	0.47	0.44	0.38
Active Pressure Coefficient, K_a	0.31	0.28	0.24
Passive Pressure Coefficient, K_p	3.25	3.54	4.20
At-rest Equivalent Fluid Pressure, pcf (Above GWT, below GWT)	54	53	37
	87	88	75
Active Equivalent Fluid Pressure, pcf (Above GWT, below GWT)	35	34	23
	78	78	70
Passive Equivalent Fluid Pressure, pcf (Above GWT, below GWT)	374	424	399
	234	267	201

GWT - Groundwater Table

Samples of all backfill material should be evaluated for its use as such. The design values and recommendations presented above assume that the backfill behind the wall will be horizontal with no surcharge loads and that a permanent drainage system will be installed behind the retaining wall to prevent the increase of hydrostatic pressures. The noted backfill should extend from the wall and upward from the top of the foundations on a line 35 degrees from the vertical.

Retaining walls should be braced during any backfilling operations and monitored for movement. If the footing construction precedes the subgrade preparation, then the footings should either be embedded below the subgrade a sufficient distance to achieve the required horizontal component or the footing should include a shear key to prevent movement.

An allowable bearing pressure of 2,500 psf should be used for the design of the retaining wall footings constructed on compacted structural fill or suitable residual soils. For analysis of sliding resistance of the base of the retaining walls, the ultimate coefficient of friction may be taken as 0.3 between concrete and stiff soil.

If the structure is designed to resist hydrostatic pressures, we recommend that the backfill as noted in that design be utilized. If there are adjacent structures that are to be located above the backfill zone, we recommend that the compaction follow the recommendations in Section 4.4.

Using a select material can significantly reduce the horizontal loads on the wall as well as improve the effectiveness of the drainage system. Compaction of backfill behind walls should be performed by lighter manual equipment. The wall should be properly braced and heavy equipment should not be used for compaction of the

wall backfill material. No heavy compaction equipment or construction loads should be allowed within 10 feet of retaining walls or half the distance of the freestanding wall-height. This will prevent any surcharge loads from adding lateral earth pressures to the retaining wall. Below grade walls should be braced during any backfilling operations and monitored for movement.

5.4 Seismic Site Classification

Subsurface information (SPT and soil classification) from the borings, published geologic information, and our experience was used to estimate the seismic site classification according to methods in the 2015 International Building Code. Based upon this information, we recommend a Seismic Class of C (Very Dense Soil and Soft Rock) for this site. Based on our understanding of the project, we have assumed a Risk Category of III. If the Risk Category is different, the values below may need to be revised. According to the ASCE 7/SEI 7-16 hazard standard information, the site has mapped 0.2 second spectral response acceleration (S_S) of approximately 0.267g and a mapped 1.0 second spectral response acceleration (S_1) of approximately 0.099g.

Using this information, Site Class C and Risk Category III, the site coefficients F_a and F_v have been determined to be 1.3 and 1.5, respectively. The design spectral response accelerations S_{DS} and S_{D1} were 0.232g and 0.099g, respectively.

6.0 PAVEMENTS

6.1 Subgrade

Typically, during construction, the pavement subgrade becomes disturbed because of traffic and environmental conditions. Prior to construction of pavements, it is essential that the subgrade be restored to a properly compacted condition. The specifications should include notes pertaining to subgrade restoration immediately prior to pavement construction. The on-site clayey soils will have a tendency to lose shear strength (and consequently pavement support capability) if they are exposed to excessive moisture. Thus, proper moisture conditioning of the subgrade prior to placement of the pavement base course will result in better pavement performance. The upper 12-inches of the subgrade soils should be compacted to at least 98 percent of the materials standard Proctor maximum dry density.

The pavement subgrades should be thoroughly proofrolled prior to fine grading to identify soft soils not encountered during the mass grading of the site. Those soft areas should be undercut and replaced with properly compacted fill.

6.2 Rigid Pavement

All Portland cement concrete pavements should contain 4 to 6 percent entrained air assuming the mix will contain ¾ -inch to 1-inch nominal maximum size aggregate. Concrete slump should be no more than 2 inches when placed by slip forming and no more than 4 inches for non-slip formed concrete. Minimum 28-day concrete compressive strength should be 4,000 psi and minimum flexural strength 550 psi.

RIGID PAVEMENT MINIMUM THICKNESS		
Pavement Materials	**Light Duty**	**Heavy Duty**
Portland Cement Concrete	6”	8”
Crushed Aggregate Base Course (ALDOT 825, Type B)	6”	6”

Pavement joints, reinforcing, and details should be designed in accordance with the applicable American Concrete Institute (ACI) standards. Portland cement concrete pavement should meet the requirements of ALDOT Section 450.

6.3 Flexible Pavement

For asphaltic pavements, a Resilient Modulus (M_R) value of 4,000 psi was estimated for determining the recommended minimum pavement sections. This M_R value should be confirmed prior to construction.

No traffic information has been provided; however, we assume that typical traffic will include occasional trucks on drives and automobiles in parking areas and drives. If this traffic information changes, it should be provided to GMC so that we can review the pavement recommendations and make any necessary changes to the pavement sections. Minimum recommended pavement sections for this project site are as follows:

Pavement Area	Minimum Section Thickness	Pavement Materials
Light Duty Pavements	1.0 inch	Asphaltic Concrete (Surface Course)
	3.0 inches	Asphaltic Concrete (Binder Course)
	6.0 inches	Crushed Aggregate Base Course (ALDOT 825, Type B)
Heavy Duty Pavements	1.5 inches	Asphaltic Concrete (Surface Course)
	4.5 inches	Asphaltic Concrete (Binder Course)
	8.0 inches	Crushed Aggregate Base Course (ALDOT 825, Type B)

A tack coat (ALDOT Section 405) shall be placed between bituminous layers. A prime coat (ALDOT Section 401) shall be placed on the base material if there is to be an extended time period between the base and asphalt placement. The pavement sections represent minimum recommended thickness for a pavement section designed for a 12-year life. However, periodic maintenance should be anticipated over the pavement design life. All pavement materials and construction procedures should conform to the State of Alabama Department of Transportation Standard Specifications for Highway Construction, Latest Edition. The base stone should be an aggregate as outlined in Section 825, Type B, and should be compacted to at least 98 percent of the modified Proctor (AASHTO T180) maximum dry density. The hot-mix asphalt should conform to Section 424.

7.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by GMC and design details furnished by GMC for the proposed project. Additional borings should be drilled at the site to help characterize the subsurface conditions. In addition, building and loading condition specific geotechnical explorations should be performed for individual building sites so that site-specific recommendations can be provided.

The recommendations submitted are based on the available soil information obtained by GMC and design details furnished by GMC for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, we should be notified immediately to determine if changes in the foundation, or other, recommendations are required. If GMC is not retained to perform these functions, GMC cannot be responsible for the impact of those conditions on the performance of the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

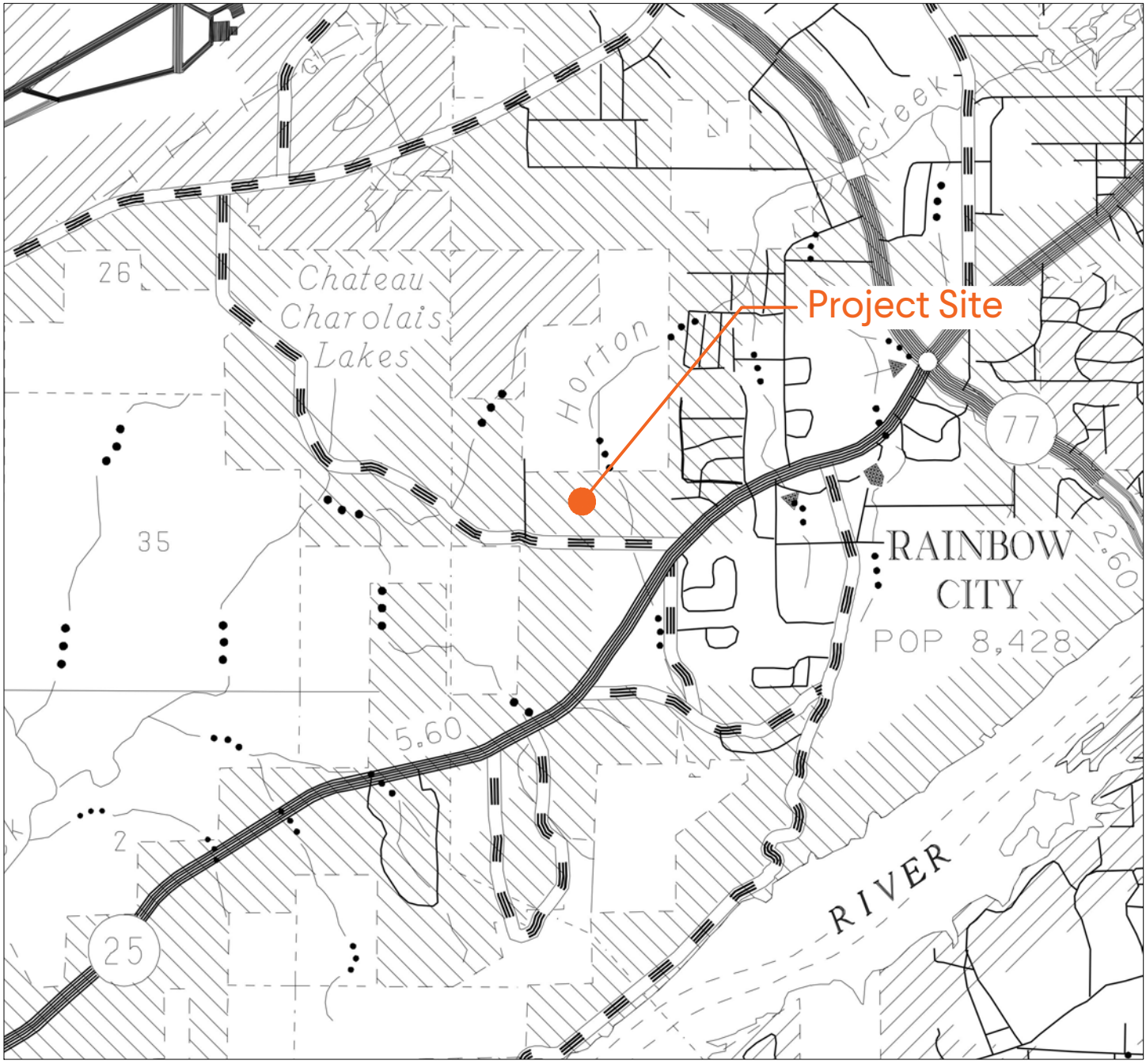
After the plans and specifications are more complete, the geotechnical engineer should be provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

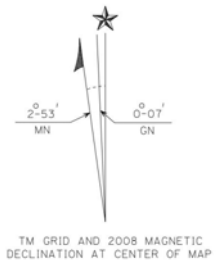
We emphasize that this report was prepared for design and informational purposes only and may not be sufficient to prepare an accurate construction budget. Contractors reviewing this report should acknowledge that the recommendations contained herein are for design and informational purposes only. In no case should this report be utilized as a substitute for the development of specific earthwork specifications.

The information contained in this report is not intended, nor is sufficient, to aid in the design of segmental or mechanically stabilized earth (MSE) retaining walls. Segmental or MSE wall designers and builders should not rely on this report and should perform independent analysis to determine all necessary soil characteristics for use in their wall design, including but not limited to, soil shear strengths, bearing capacities, global stability, etc.

APPENDIX

Figure 1 – Site Location Map
Figure 2 – Site Geology Map
Figure 3 – USGS Site Map
Figure 4 – Boring Location Plan
Soil Classification Chart
Subsurface Diagrams
Boring Records
Summary of Laboratory Results
Field and Laboratory Procedures





TM GRID AND 2008 MAGNETIC DECLINATION AT CENTER OF MAP

Reference: General Highway Map of Etowah County, ALDOT, 2008

Rainbow City Rec Center
Rainbow City, Alabama

Site Location Map

Figure 1

SUPPLEMENTAL DRAWING

GMC # GBHM230043

10/18/2023

DRAWN BY: MJM

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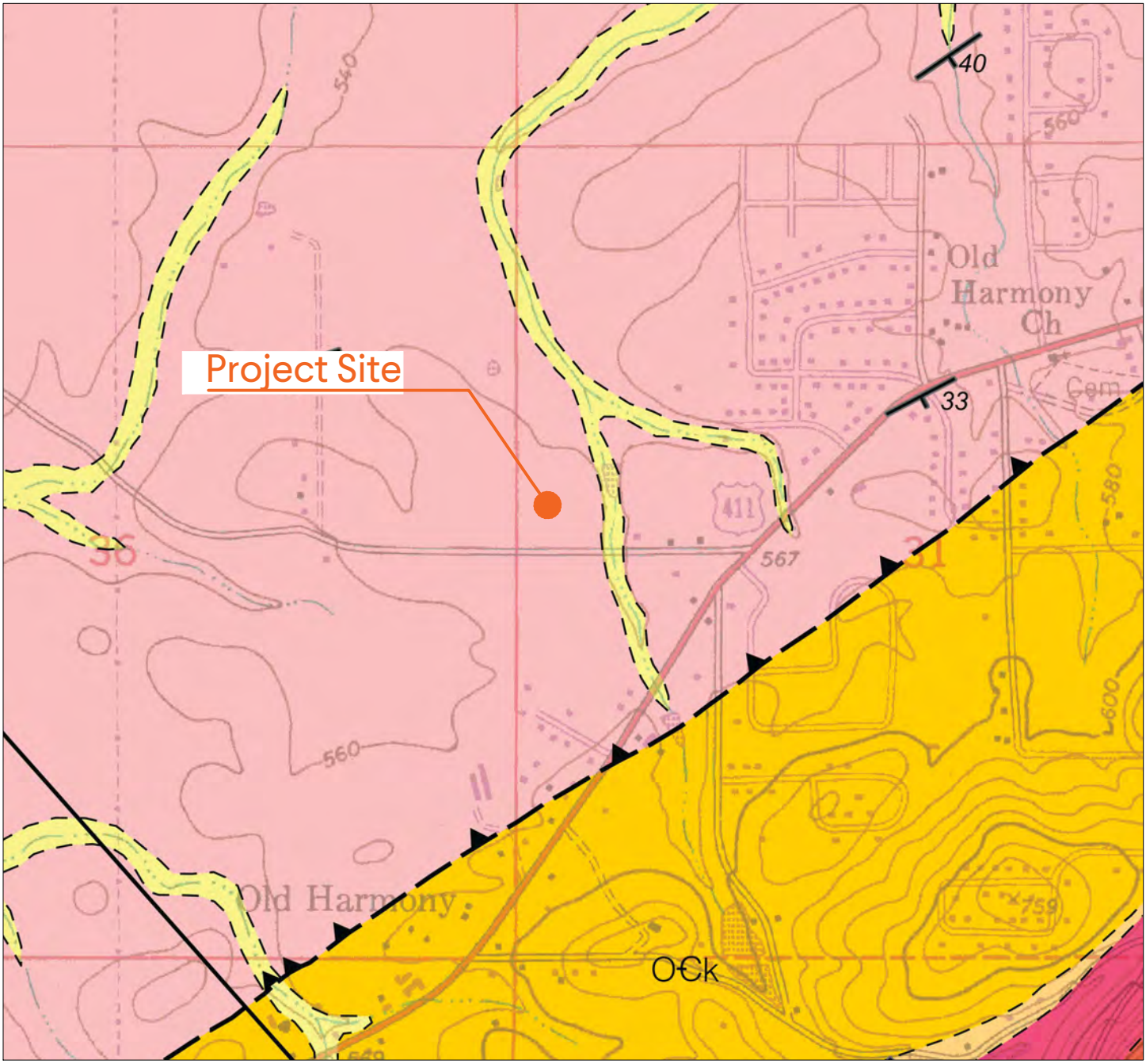

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Conasauga Formation (Middle and Upper Cambrian)—***Gadsden mushwad and Rome thrust sheet***: Dark-gray to dark-greenish-gray shale commonly containing lenticular to thin-bedded medium- to dark-gray micritic limestone that is bioturbated in part. Ribbon-banded light- to dark-gray limestone and medium-gray dolomite and dark-gray stylonodular limestone are locally present. ***Helena thrust sheet***: Light-gray, medium- to thick-bedded, coarsely crystalline, vuggy dolomite.

N

Reference: Osborne, W.E., ant Thomas, W.A., 2021, Geology of the Dunaway Mountain 7.5-Minute Quadrangle, Etowah and St. Clair Counties, Alabama Geological Survey

Rainbow City Rec Center
Rainbow City, Alabama

Site Geology Map

Figure 2

SUPPLEMENTAL DRAWING

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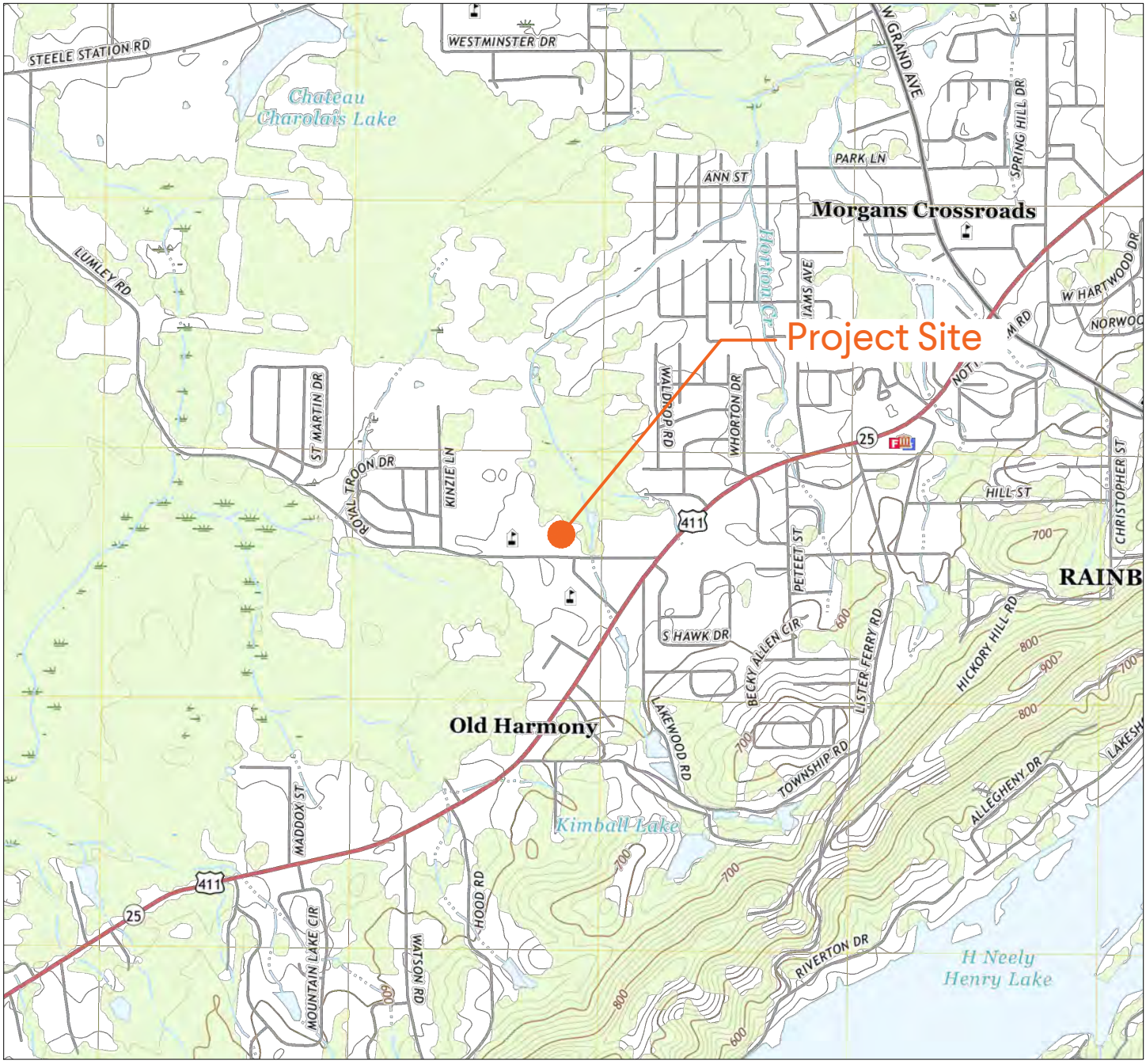

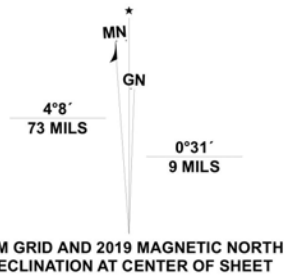

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

Reference: USGS Quadrangles 7.5 Minute Series (Topographic)

Rainbow City Rec Center
Rainbow City, Alabama

Dunaway Mountain (2020)
USGS Site Map

Figure 3

SUPPLEMENTAL DRAWING

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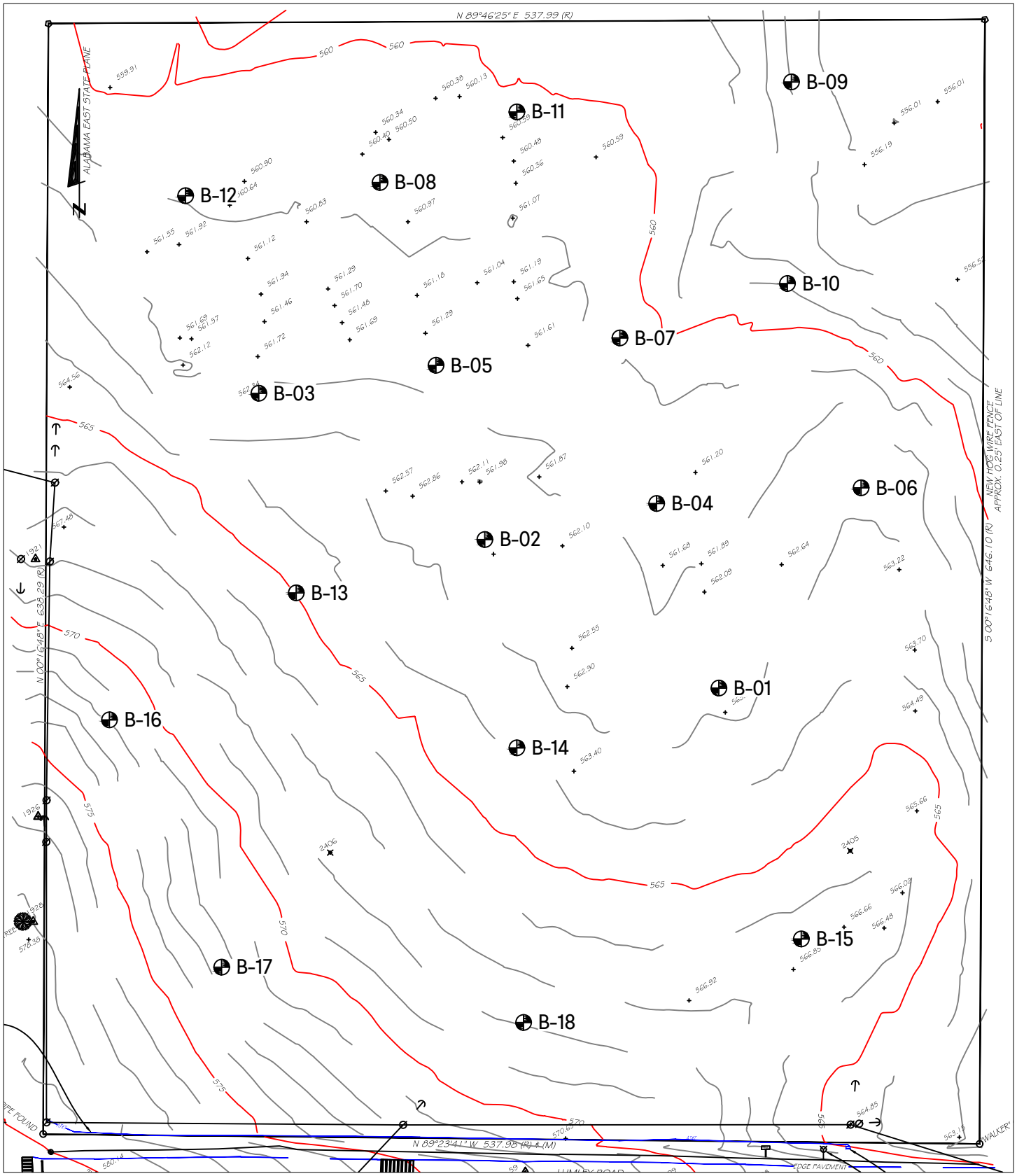

Approximate Boring Location

Reference: Drawing adapted from the provided "Topographic & Location Survey" by Skipper Engineering, Inc.

Rainbow City Rec Center
Rainbow City, Alabama

Boring Location Plan

Figure 4

SUPPLEMENTAL DRAWING

GMC # GBHM230043

10/18/2023

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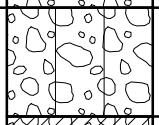
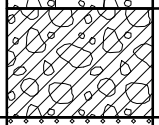
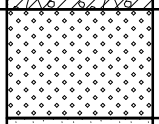
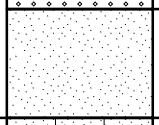
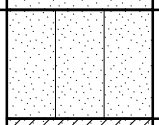
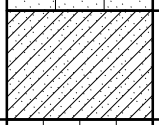
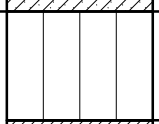
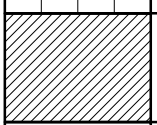
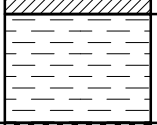
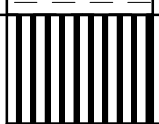
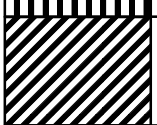
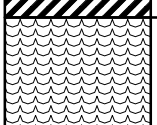
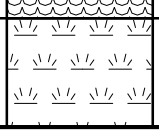
SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

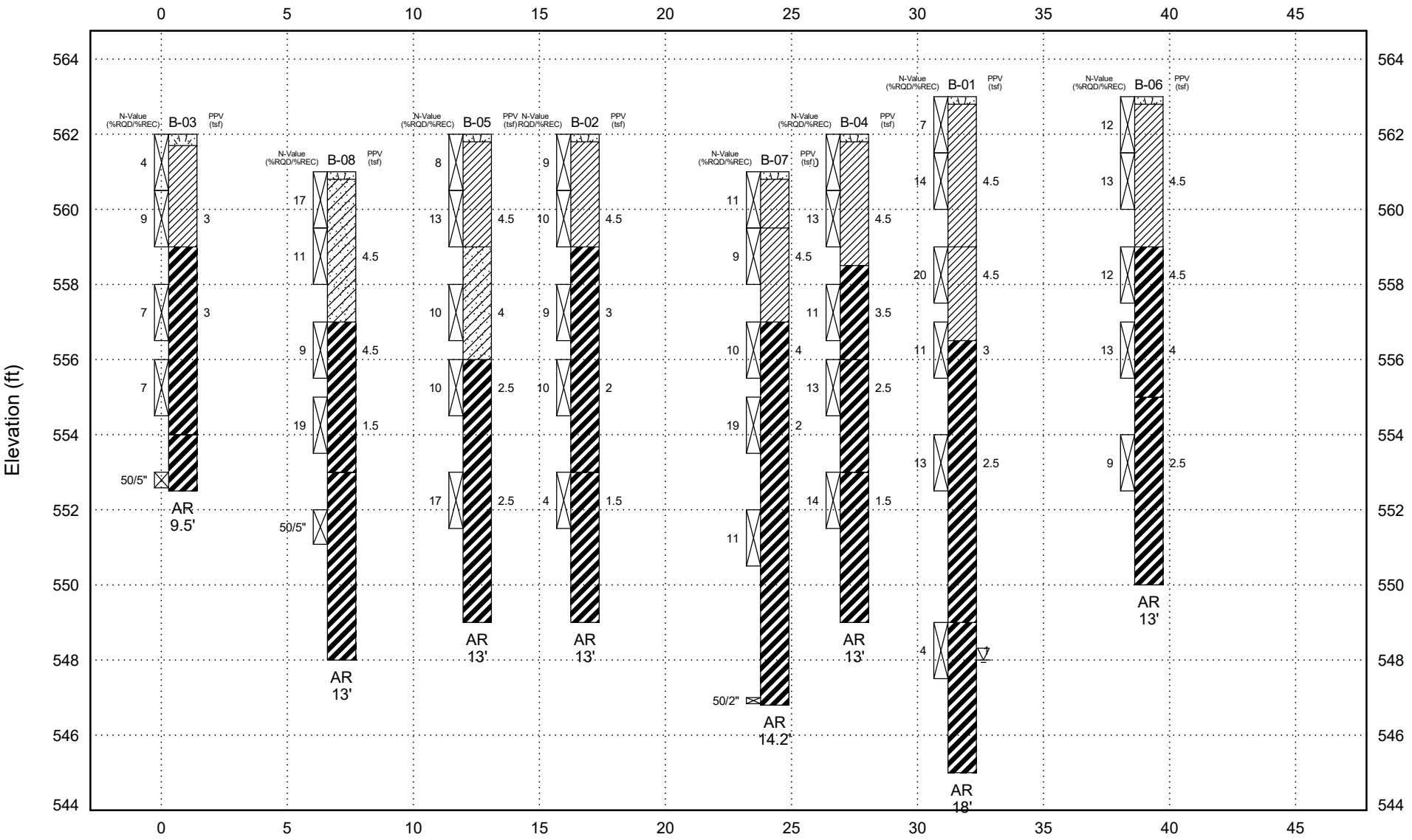
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SUBSURFACE DIAGRAM
Building Area

TOPSOIL CL CH SC

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL



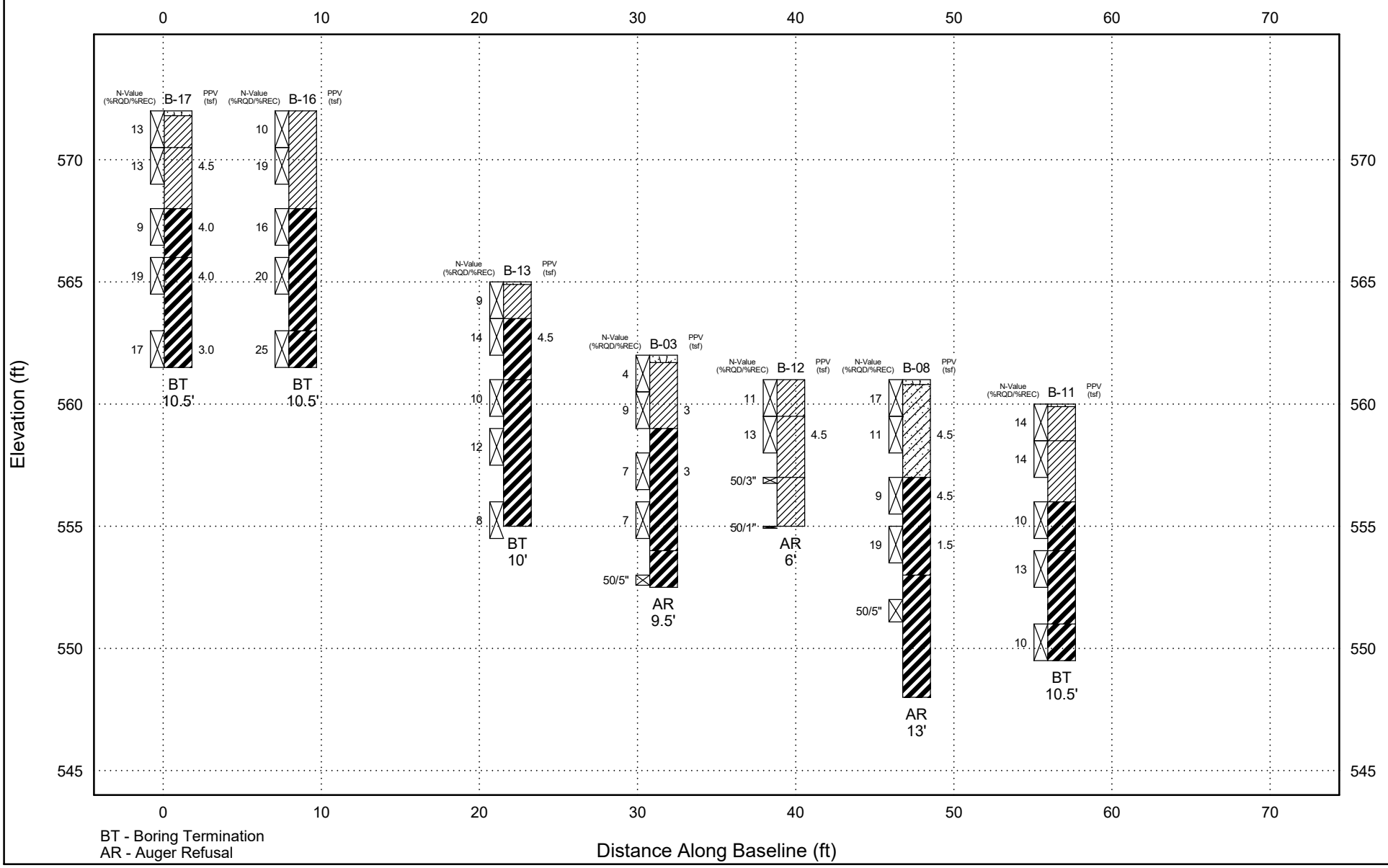
BT-AR DEPTH LOG GBHM230043 RAINBOW CITY REC CENTER.GPJ GMC DATA TEMPLATE.GDT 10/19/23

SUBSURFACE DIAGRAM

TOPSOIL CL CH SC

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL



BT - Boring Termination
AR - Auger Refusal

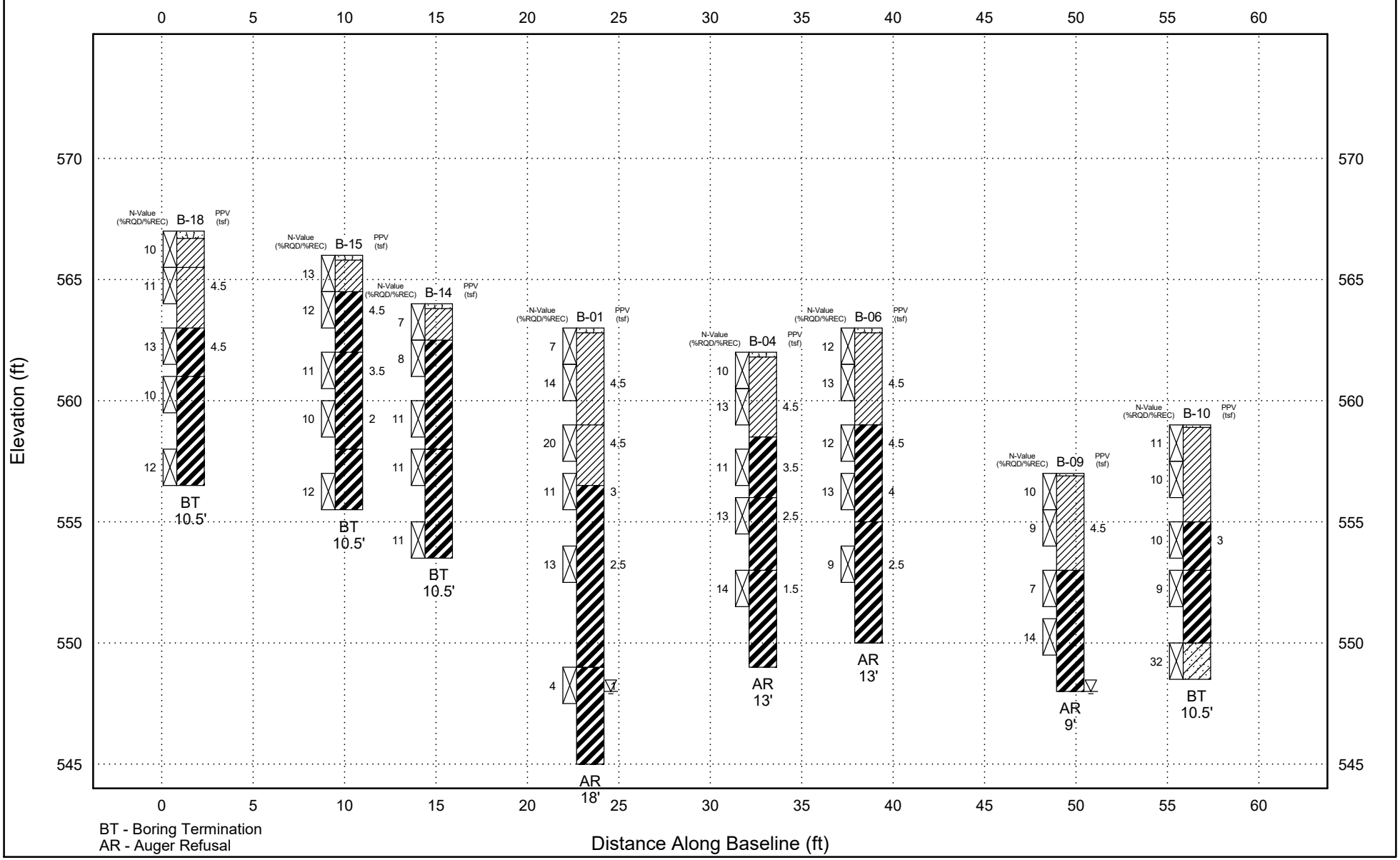
BT-AR DEPTH LOG GBHM230043 RAINBOW CITY REC CENTER.GPJ GMC DATA TEMPLATE.GDT 10/19/23

SUBSURFACE DIAGRAM

TOPSOIL CL CH SC

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL



BT-AR DEPTH LOG GBHM230043 RAINBOW CITY REC CENTER.GPJ GMC DATA TEMPLATE.GDT 10/19/23

BORING NUMBER B-01

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 563 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
▽ **AT TIME OF DRILLING** 15.00 ft / Elev 548.00 ft
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"										
			SANDY LEAN CLAY (CL), yellowish-brown & black, medium to stiff	SS		3-3-4 (7)			11				
560				SS		3-5-9 (14)	4.5		16	38	17	21	68
	5		SANDY LEAN CLAY (CL), white, yellowish-brown, black, stiff	SS		4-9-11 (20)	4.5		18				
			SANDY FAT CLAY (CH), brown, black, light gray, stiff	SS		3-5-6 (11)	3						
555													
	10			SS		3-6-7 (13)	2.5						
550													
	15		SANDY FAT CLAY (CH), yellowish-red, brown, black, light gray, soft - w/ weathered shale ▽	SS		2-2-2 (4)	1						
545			Auger refusal was encountered at 18.0 feet.										
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-02

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 562 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"										
			SANDY LEAN CLAY (CL), light gray, yellow, stiff	SS		3-4-5 (9)			10				
560				SS		4-4-6 (10)	4.5		15	36	17	19	68
			FAT CLAY (CH), light gray, red, stiff										
	5			SS		2-4-5 (9)	3		24				
555				SS		3-4-6 (10)	2						
	10		FAT CLAY (CH), yellowish-red, light gray, soft	SS		2-2-2 (4)	1.5						
550													
			Auger refusal was encountered at 13.0 feet.										
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-03

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 562 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 3"										
560			SANDY LEAN CLAY (CL), yellow, light gray, soft to stiff	SS		3-2-2 (4)			15				
				SS		2-4-5 (9)	3		18				
			FAT CLAY (CH), red, light gray, black, medium										
	5			SS		3-3-4 (7)	3		28				
555				SS		2-3-4 (7)							
			SANDY FAT CLAY (CH), light brown, hard - w/ weathered shale										
	10			SS		50/5"							
			Auger refusal was encountered at 9.5 feet.										
550													
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-04

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 562 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"										
560			SANDY LEAN CLAY (CL), red, yellow, black, stiff	SS		3-5-5 (10)			12				
				SS		4-5-8 (13)	4.5		14				
	5		SANDY FAT CLAY (CH), yellow, light gray, black, stiff	SS		4-5-6 (11)	3.5		21				
555			FAT CLAY (CH), light greenish-gray, stiff	SS		5-7-6 (13)	2.5						
	10		FAT CLAY (CH), light brown, stiff - w/ weathered shale	SS		5-6-8 (14)	1.5						
550			Auger refusal was encountered at 13.0 feet.										
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-05

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 562 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"										
560			SANDY LEAN CLAY (CL), yellow, light gray, stiff	SS		3-3-5 (8)			11				
				SS		5-6-7 (13)	4.5		20				
			CLAYEY SAND (SC), red, yellow, light gray, loose										
	5			SS		4-5-5 (10)	4		26	62	26	36	43
555			FAT CLAY (CH), red, yellow, light gray, black, stiff to very stiff - w/ weathered shale	SS		3-5-5 (10)	2.5						
	10			SS		3-6-11 (17)	2.5						
550			Auger refusal was encountered at 13.0 feet.										
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-06

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 563 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 1"										
			SANDY LEAN CLAY (CL), light brown, red, yellow, light gray, stiff	SS		4-6-6 (12)			8				
560				SS		3-5-8 (13)	4.5		15				
	5		FAT CLAY (CH), yellow & light gray, stiff	SS		5-5-7 (12)	4.5		25				
				SS		4-6-7 (13)	4						
555			FAT CLAY (CH), light brown, stiff - w/ weathered shale										
	10			SS		4-4-5 (9)	2.5						
550			Auger refusal was encountered at 13.0 feet.										
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-07

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 561 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
560	0		TOPSOIL 2"										
			SANDY LEAN CLAY (CL), light brown, stiff	SS		4-8-3 (11)			13				
			LEAN CLAY (CL), red, light gray, stiff	SS		4-4-5 (9)	4.5		18				
	5		SANDY FAT CLAY (CH), light yellowish-brown, gray, stiff to very stiff - w/ weathered shale	SS		3-4-6 (10)	4		26				
555				SS		3-8-11 (19)	2						
	10			SS		2-6-5 (11)							
550													
	15		Auger refusal was encountered at 14.2 feet.	SS		50/2"							
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-08

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 561 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY K. Wales **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"										
560			CLAYEY SAND (SC), light brown, light gray, black, medium	SS		7-8-9 (17)			11				
				SS		5-6-5 (11)	4.5		13	44	17	27	46
	5		SANDY FAT CLAY (CH), light brown, light gray, black, stiff to very stiff	SS		3-3-6 (9)	4.5		21				
555				SS		6-8-11 (19)	1.5						
			SANDY FAT CLAY (CH), gray, white, hard - w/ weathered shale										
	10			SS		23-50/5"							
550			Auger refusal was encountered at 13.0 feet.										
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-09

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 557 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
▽ **AT TIME OF DRILLING** 9.00 ft / Elev 548.00 ft
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 1"										
555			SANDY LEAN CLAY (CL), light brown, gray, stiff	SS		4-4-6 (10)			11				
				SS		3-5-4 (9)	4.5		16				
	5		FAT CLAY (CH), brown, gray, yellow, medium to stiff	SS		2-3-4 (7)			26	57	18	39	89
550				SS		3-5-9 (14)			24				
	10		▽ Auger refusal was encountered at 9.0 feet.										
545													
	15												
540													
	20												
535													
	25												
530													
	30												
525													
	35												

BORING NUMBER B-10

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 559 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 1"										
			SANDY LEAN CLAY (CL), light yellowish-brown, stiff	SS		5-6-5 (11)							
				SS		5-6-4 (10)							
555													
	5		FAT CLAY (CH), yellowish-brown, stiff	SS		3-4-6 (10)	3		27				
			SANDY FAT CLAY (CH), brown, yellowish-brown, gray, stiff	SS		3-4-5 (9)			27	65	23	42	59
550													
	10		CLAYEY SAND (SC), brown, gray, dense - w/ weathered rock	SS		8-17-15 (32)			11				
			Boring was terminated at 10.5 feet.										
545													
	15												
540													
	20												
535													
	25												
530													
	30												
525													
	35												

BORING NUMBER B-11

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 560 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
560	0		TOPSOIL 1"										
			SANDY LEAN CLAY (CL), light grayish-brown, stiff	SS		6-6-8 (14)							
			SANDY LEAN CLAY (CL), yellowish-gray, grayish-brown, stiff	SS		4-6-8 (14)							
555	5		FAT CLAY (CH), yellowish-gray, grayish-brown, stiff	SS		3-4-6 (10)							
			SANDY FAT CLAY (CH), yellowish-brown, gray, stiff	SS		4-5-8 (13)							
550	10		SANDY FAT CLAY (CH), stiff- w/ weathered shale	SS		4-5-5 (10)							
			Boring was terminated at 10.5 feet.										
545	15												
540	20												
535	25												
530	30												
525	35												

BORING NUMBER B-12

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 561 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
560	0		SANDY LEAN CLAY (CL), gray, stiff - w/ trace organics	SS		5-7-4 (11)							
			LEAN CLAY (CL), yellowish-brown, gray, stiff	SS		4-7-6 (13)	4.5						
	5		LEAN CLAY (CL), yellowish-brown, gray, hard- w/ weathered shale	SS		50/3"							
555			Auger refusal was encountered at 6.0 feet.	SS		50/1"							
	10												
550													
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-13

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 565 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
565	0		TOPSOIL 1"	SS		6-4-5 (9)							
			SANDY LEAN CLAY (CL), brown, stiff - w/ trace organics	SS		5-7-7 (14)	4.5		26				
			FAT CLAY (CH), reddish-brown, stiff										
560	5		FAT CLAY (CH), reddish-brown, yellowish-brown, black, stiff to medium	SS		3-4-6 (10)			32	84	28	56	90
				SS		4-5-7 (12)			31				
555	10			SS		2-3-5 (8)							
			Boring was terminated at 10.0 feet.										
550	15												
545	20												
540	25												
535	30												
530	35												

BORING NUMBER B-14

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 564 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"										
			SANDY LEAN CLAY (CL), brown, black, medium - w/ trace organics	SS		3-4-3 (7)							
			SANDY FAT CLAY (CH), yellowish-brown, medium to stiff	SS		3-4-4 (8)							
560													
	5			SS		3-5-6 (11)							
			SANDY FAT CLAY (CH), yellowish-brown, stiff- w/ weathered shale	SS		3-5-6 (11)							
555													
	10			SS		4-4-7 (11)							
			Boring was terminated at 10.5 feet.										
550													
	15												
545													
	20												
540													
	25												
535													
	30												
530													
	35												

BORING NUMBER B-15

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 566 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0												
565			TOPSOIL 2"	SS		4-7-6 (13)							
			LEAN CLAY (CL), light brown, stiff - w/ trace organics										
			FAT CLAY (CH), reddish-brown, yellowish-brown, stiff	SS		3-6-6 (12)	4.5						
	5		FAT CLAY (CH), reddish-brown, yellowish-brown, stiff	SS		4-5-6 (11)	3.5		35				
560				SS		3-4-6 (10)	2		39	86	32	54	94
			FAT CLAY (CH), pale brown, stiff - w/ weathered shale										
	10			SS		4-5-7 (12)							
555			Boring was terminated at 10.5 feet.										
	15												
550													
	20												
545													
	25												
540													
	30												
535													
	35												

BORING NUMBER B-16

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/11/23 **COMPLETED** 9/11/23
GROUND ELEVATION 572 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		SANDY LEAN CLAY (CL), light brown, stiff to very stiff	SS		3-4-6 (10)							
570				SS		8-8-11 (19)							
	5		SANDY FAT CLAY (CH), reddish-brown, yellowish-brown, very stiff	SS		6-7-9 (16)							
565				SS		8-10-10 (20)							
	10		SANDY FAT CLAY (CH), reddish-brown, gray, very stiff - w/ weathered shale	SS		6-11-14 (25)							
560			Boring was terminated at 10.5 feet.										
	15												
555													
	20												
550													
	25												
545													
	30												
540													
	35												

BORING NUMBER B-17

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 572 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 2"	SS		3-5-8 (13)			16				
570			LEAN CLAY (CL), light brown, stiff - w/ trace organics LEAN CLAY (CL), light brown, gray, stiff	SS		4-6-7 (13)	4.5		19	44	20	24	86
	5		FAT CLAY (CH), red, yellowish-brown, stiff	SS		3-4-5 (9)	4.0		32				
565			SANDY FAT CLAY (CH), red, yellowish-brown, gray, very stiff	SS		5-8-11 (19)	4.0						
	10			SS		4-7-10 (17)	3.0						
560			Boring was terminated at 10.5 feet.										
	15												
555													
	20												
550													
	25												
545													
	30												
540													
	35												

BORING NUMBER B-18

CLIENT City of Rainbow City
PROJECT NAME Rainbow City Rec Center
PROJECT NUMBER GBHM230043
PROJECT LOCATION Rainbow City, AL
DATE STARTED 9/12/23 **COMPLETED** 9/12/23
GROUND ELEVATION 567 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING Not Encountered
LOGGED BY D. Gamlin **CHECKED BY** M. McNeill
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		TOPSOIL 3"										
			LEAN CLAY (CL), brown, stiff - w/ trace organics	SS		3-6-4 (10)							
565			SANDY LEAN CLAY (CL), brown, yellowish-brown, stiff	SS		6-6-5 (11)	4.5						
	5		FAT CLAY (CH), red, yellowish-brown, gray, stiff	SS		5-5-8 (13)	4.5						
560			SANDY FAT CLAY (CH), yellowish-brown, stiff - w/ weathered shale	SS		4-4-6 (10)							
	10			SS		3-5-7 (12)							
555			Boring was terminated at 10.5 feet.										
	15												
550													
	20												
545													
	25												
540													
	30												
535													
	35												

SUMMARY OF LABORATORY RESULTS

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

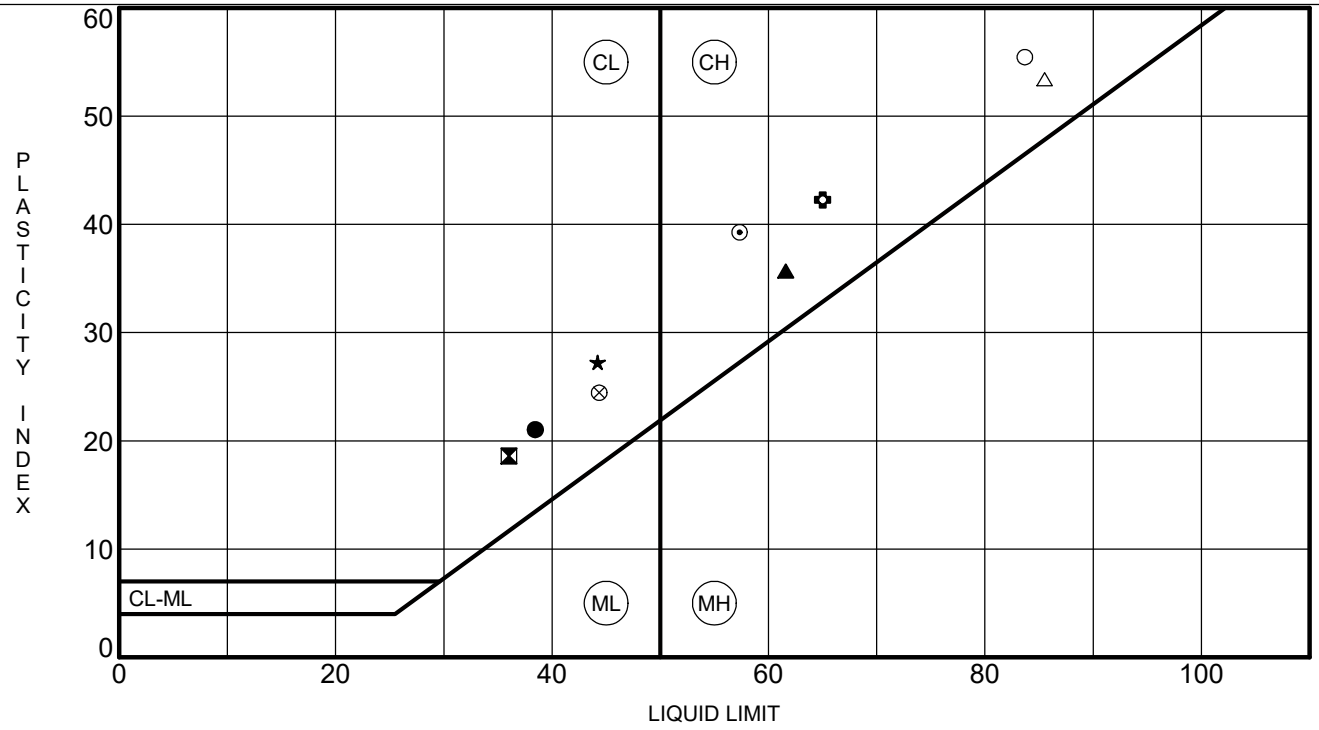
PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Max. Sieve Size Tested (mm)	%<#200 Sieve	Natural Moisture (%)	Class-ification	Opt. Moisture Content (%)	Max Dry Density (pcf)	Specific Gravity
B-01	0-1.5						10.6				
B-01	1.5-3	38	17	21	9.5	68	15.7	CL			
B-01	4-5.5						18.1				
B-02	0-1.5						10.3				
B-02	1.5-3	36	17	19	9.5	68	15.3	CL			
B-02	4-5.5						24.1				
B-03	0-1.5						15.3				
B-03	1.5-3						17.6				
B-03	4-5.5						28.2				
B-04	0-1.5						12.5				
B-04	1.5-3						14.1				
B-04	4-5.5						21.2				
B-05	0-1.5						10.9				
B-05	1.5-3						20.1				
B-05	4-5.5	62	26	36	9.5	43	25.6	SC			
B-06	0-1.5						8.2				
B-06	1.5-3						14.5				
B-06	4-5.5						25.0				
B-07	0-1.5						12.6				
B-07	1.5-3						17.9				
B-07	4-5.5						25.7				
B-08	0-1.5						10.7				
B-08	1.5-3	44	17	27	9.5	46	13.3	SC			
B-08	4-5.5						21.2				
B-09	0-1.5						11.4				
B-09	1.5-3						15.5				
B-09	4-5.5	57	18	39	4.75	89	26.2	CH			
B-09	6-7.5						23.8				
B-10	4-5.5						27.0				
B-10	6-7.5	65	23	42	4.75	59	27.4	CH			
B-10	9-10.5						11.3				
B-13	1.5-3						26.3				
B-13	4-5.5	84	28	56	4.75	90	32.3	CH			
B-13	6-7.5						30.9				
B-15	4-5.5						34.6				
B-15	6-7.5	86	32	54	4.75	94	38.9	CH			
B-17	0-1.5						15.8				
B-17	1.5-3	44	20	24	4.75	86	18.6	CL			
B-17	4-5.5						32.0				

ATTERBERG LIMITS' RESULTS

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL

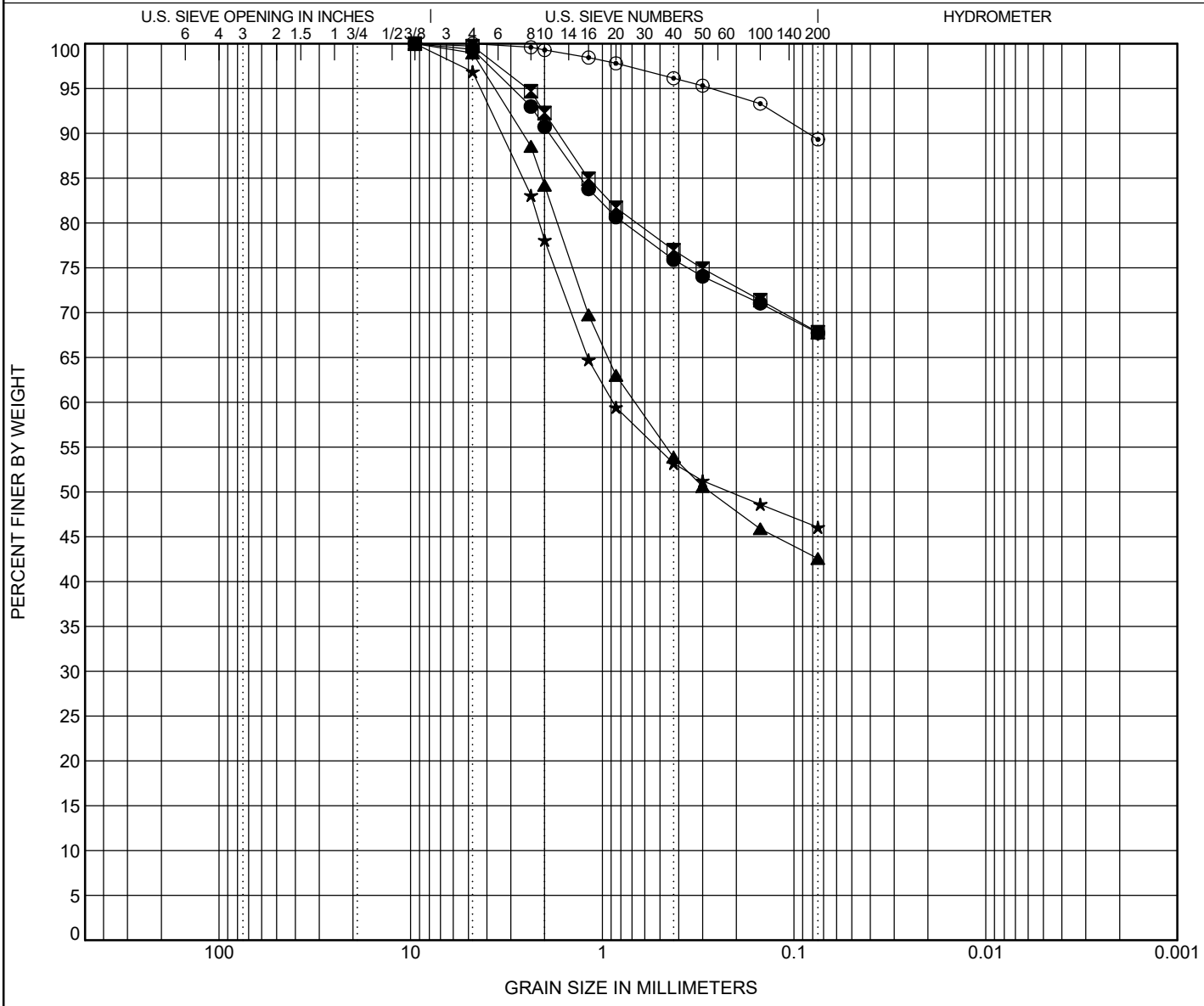


	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-01**	**1.5-3.0**	**38**	**17**	**21**	**68**	**SANDY LEAN CLAY(CL)**
⊠	**B-02**	**1.5-3.0**	**36**	**17**	**19**	**68**	**SANDY LEAN CLAY(CL)**
▲	**B-05**	**4.0-5.5**	**62**	**26**	**36**	**43**	**CLAYEY SAND(SC)**
★	**B-08**	**1.5-3.0**	**44**	**17**	**27**	**46**	**CLAYEY SAND(SC)**
⊙	**B-09**	**4.0-5.5**	**57**	**18**	**39**	**89**	**FAT CLAY(CH)**
✿	**B-10**	**6.0-7.5**	**65**	**23**	**42**	**59**	**SANDY FAT CLAY(CH)**
○	**B-13**	**4.0-5.5**	**84**	**28**	**56**	**90**	**FAT CLAY(CH)**
△	**B-15**	**6.0-7.5**	**86**	**32**	**54**	**94**	**FAT CLAY(CH)**
⊗	**B-17**	**1.5-3.0**	**44**	**20**	**24**	**86**	**LEAN CLAY(CL)**

GRAIN SIZE DISTRIBUTION

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

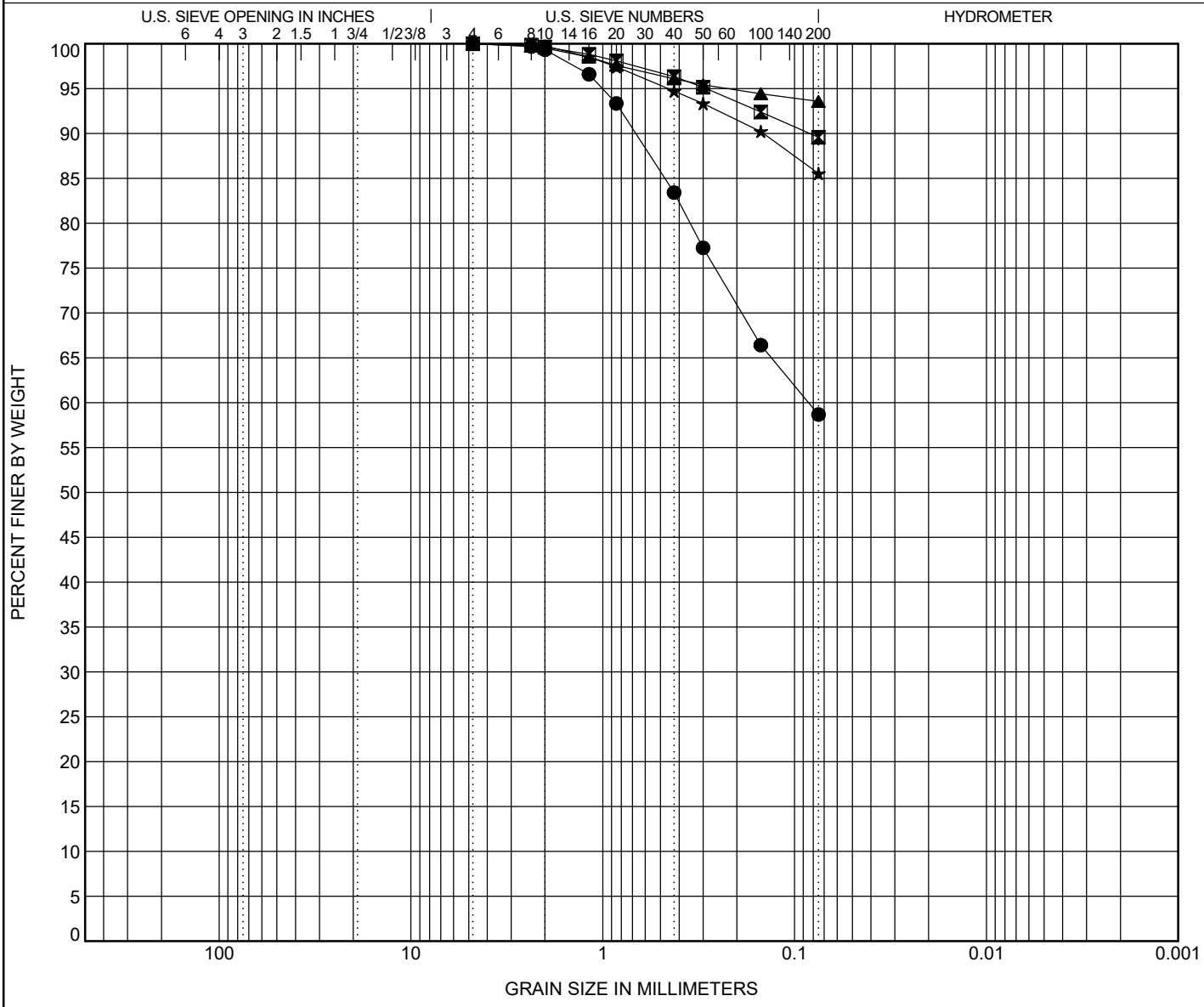
	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-01	1.5-3.0	SANDY LEAN CLAY(CL)	38	17	21		
⊠	B-02	1.5-3.0	SANDY LEAN CLAY(CL)	36	17	19		
▲	B-05	4.0-5.5	CLAYEY SAND(SC)	62	26	36		
★	B-08	1.5-3.0	CLAYEY SAND(SC)	44	17	27		
⊙	B-09	4.0-5.5	FAT CLAY(CH)	57	18	39		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-01	1.5-3.0	9.5				0.6	31.6	67.7	
⊠	B-02	1.5-3.0	9.5				0.3	31.9	67.8	
▲	B-05	4.0-5.5	9.5	0.677			1.0	56.4	42.6	
★	B-08	1.5-3.0	9.5	0.88			3.1	50.8	46.1	
⊙	B-09	4.0-5.5	4.75				0.0	10.7	89.3	

GRAIN SIZE DISTRIBUTION

CLIENT City of Rainbow City **PROJECT NAME** Rainbow City Rec Center

PROJECT NUMBER GBHM230043 **PROJECT LOCATION** Rainbow City, AL



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-10**	**6.0-7.5**	**SANDY FAT CLAY(CH)**	**65**	**23**	**42**		
⊠	**B-13**	**4.0-5.5**	**FAT CLAY(CH)**	**84**	**28**	**56**		
▲	**B-15**	**6.0-7.5**	**FAT CLAY(CH)**	**86**	**32**	**54**		
★	**B-17**	**1.5-3.0**	**LEAN CLAY(CL)**	**44**	**20**	**24**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-10**	**6.0-7.5**	**4.75**	**0.084**			**0.0**	**41.3**	**58.7**	
⊠	**B-13**	**4.0-5.5**	**4.75**				**0.0**	**10.4**	**89.6**	
▲	**B-15**	**6.0-7.5**	**4.75**				**0.0**	**6.4**	**93.6**	
★	**B-17**	**1.5-3.0**	**4.75**				**0.0**	**14.5**	**85.5**	

GMC

FIELD TEST PROCEDURES

General

The general field procedures employed by Goodwyn Mills Cawood, LLC (GMC), are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as borings.

The detailed collection methods used during this exploration are presented in the following paragraphs.

Standard Drilling Techniques

General: To obtain subsurface samples, borings are drilled using one of several alternate techniques depending upon the subsurface conditions. These techniques are as follows:

In Soils:

a) Continuous hollow stem augers.
b) Rotary borings using roller cone bits or drag bits, and water or drilling mud to flush the hole.
c) "Hand" augers.

In Rock:

a) Core drilling with diamond-faced, double or triple tube core barrels.
b) Core boring with roller cone bits.

Hollow Stem Auger: A hollow stem augers consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Rotary Borings: Rotary drilling involves the use of roller cone or drag type drill bits attached to the end of drill rods. A flushing medium, normally water or bentonite slurry, is pumped through the rods to clear the cuttings from the bit face and flush them to the surface. Casing is sometimes set behind the advancing bit to prevent the hole from collapsing and to restrict the penetration of the drilling fluid into the surrounding soils. Cuttings returned to the surface by the drilling fluid are typically collected in a settling tank, to allow the fluid to be recirculated.

Hand Auger Boring: Hand auger borings are advanced by manually twisting a 4" diameter steel bucket auger into the ground and withdrawing it when filled to observe the sample collected. Posthole diggers are sometimes used in lieu of augers to obtain shallow soil samples. Occasionally these hand auger borings are used for driving 3-inch diameter steel tubes to obtain intact soil samples.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemented soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material that cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as "refusal material". Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D2113 using a diamond studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

Sampling and Testing in Boreholes

General: Several techniques are used to obtain samples and data in soils; however, the most common methods in this area are:

a) Standard Penetrating Testing
b) Water Level Readings

These procedures are presented below. Any additional testing techniques employed during this exploration are contained in other sections of the Appendix.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2-inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Records. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water table readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water table at the time of our field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water table through short-term water level readings. Also, fluctuation in the water table should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Records are determined by field crews immediately after the drilling tools are removed, and several hours after the borings are completed, if possible. The time lag is intended to permit stabilization of the groundwater table, which may have been disrupted by the drilling operation.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone. The cave-in depth is measured and recorded on the Boring Records.

Boring Records

The subsurface conditions encountered during drilling are reported on a field boring record prepared by the Driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of ground water. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed, a geotechnical professional classifies the soil samples and prepares the final Boring Records, which are the basis for all evaluations and recommendations. The following terms are taken from ASTM D2487 or Deere's Technical Description of Rock Cores for Engineering Purposes, Rock Mechanical Engineering Geology 1, pp. 18-22.

GMC

Relative Density of Cohesionless Soils From Standard Penetration Test	
Very Loose	‹ 4 bpf
Loose	5 - 10 bpf
Medium	11 – 30 bpf
Dense	31 - 50 bpf
Very Dense	› 50 bpf
(bpf = blows per foot, ASTM D 1586)	

Consistency of Cohesive Soils	
Very Soft	‹ 2 bpf
Soft	3 - 4 bpf
Medium	5 - 8 bpf
Stiff	9 - 15 bpf
Very Stiff	16 - 30 bpf
Hard	› 30 bpf

Relative Hardness of Rock
Very Soft Rock disintegrates or easily compresses to touch; can be hard to very hard soil.
Soft Rock may be broken with fingers.
Moderately Soft Rock may be scratched with a nail, corners and edges may be broken with fingers.
Moderately Hard Rock a light blow of hammer is required to break samples.
Hard Rock a hard blow of hammer is required to break sample.

Particle Size Identification	
Boulders	Larger than 12"
Cobbles	3" - 12"
Gravel	
Coarse	3/4" - 3"
Fine	4.76mm - 3/4"
Sand	
Coarse	2.0 - 4.76 mm
Medium	0.42 - 2.00 mm
Fine	0.42 - 0.074 mm
Fines (Silt or Clay)	Smaller than 0.074 mm

Rock Continuity	
RECOVERY = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}}$ x 100 %	
Description	Core Recovery %
Incompetent	Less than 40
Competent	40 - 70
Fairly Continuous	71 - 90
Continuous	91 - 100

Relative Quality of Rocks	
RQD = $\frac{\text{Total core, counting only pieces › 4" long}}{\text{Length of Core Run}}$ x 100 %	
Description	RQD %
Very Poor	0 - 25 %
Poor	25 - 50 %
Fair	50 - 75 %
Good	75 - 90 %
Excellent	90 - 100 %

LABORATORY TESTING

GENERAL

The laboratory testing procedures employed by Goodwyn Mills Cawood, LLC (GMC) are in general accordance with ASTM standard methods and other applicable specifications.

Several test methods, described together with others in this Appendix, were used during the course of this exploration. The Laboratory Data Summary sheet indicates the specific tests performed.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Boring Records".

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

POCKET PENETROMETER TEST

A pocket penetrometer test is performed by pressing the tip of a small, spring-loaded penetrometer with even pressure to a prescribed depth into a soil sample. This test yields a value for unconfined compressive strength, which may be correlated with unconfined compressive strengths obtained by other laboratory methods.

MOISTURE CONTENT

Moisture contents are determined from representative portions of the specimen. The soil is dried to a constant weight in an oven at 110° C and the loss of moisture during the drying process is measured. From this data, the moisture content is computed.

ATTERBERG LIMITS

Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL) tests are performed to aid in the classification of soils and to determine the plasticity and volume change characteristics of the materials. The Liquid Limit is the minimum moisture content at which a soil will flow as a heavy viscous fluid. The Plastic Limit is the minimum moisture content at which the soil behaves as a plastic material. The Shrinkage Limit is the moisture content below which no further volume change will take place with continued drying. The Plasticity Index (PI) is the numeric difference of Liquid Limit and Plastic Limit and indicates the range of moisture content over which a soil remains plastic. These tests are performed in accordance with ASTM D4318, D4943 and D427.

PARTICLE SIZE DISTRIBUTION

The distribution of soils coarser than the No. 200 (75-mm) sieve is determined by passing a representative specimen through a standard set of nested sieves. The weight of material retained on each sieve is determined and the percentage retained (or passing) is calculated. A specimen may be washed through only the No. 200 sieve, if the full range of particle sizes is not required. The percentage of material passing the No. 200 sieve is reported. The distribution of materials finer than the No. 200 sieve is determined by use of a hydrometer. The particle sizes and distribution are computed from the time rate of settlement of the different size particles while suspended in water. These tests are performed in accordance with ASTM D-421, D-422 and D-1140.

ATTACHMENT "A"
TO PROPOSAL FORM

GENERAL CONTRACTOR _____

UNIT PRICES: 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, fees, 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 of the Construction Contract.

Refer to Section 01 2200 – Unit Prices and the respective item Specification Section for the complete Unit Price item description, quantities, units, and measurement thereof.

Submit the following Unit Prices with the Proposal Form on Bid Date.

	UNIT PRICE ITEM	UNIT OF MEASURE	QUANTITY	UNIT PRICE	ALLOWANCE INCLUDED IN BID
A	UNDERCUT AND BACKFILL IN BUILDING CONTROL AREA	CY	250	$_____	$_____
B	UNDERCUT AND BACKFILL IN PAVING CONTROL AREA	CY	250	$_____	$_____

Unit Abbreviations: Each Item (EA), Ton (TN), Cubic Yard (CY), Square Yard (SY), Cubic Foot (CF), Square Foot (SF), Linear Foot (LF).

SIGNED this _____ day of _____, 2024.

CONTRACTOR

_____
(Contractor Company Name)

By:

_____

_____
(Signee's Printed Name and Title)

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ATTACHMENT "A"
TO PROPOSAL FORM

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Unit Abbreviations: Each Item (EA), Ton (TN), Cubic Yard (CY), Square Yard (SY), Cubic Foot (CF), Square Foot (SF), Linear Foot (LF).

SIGNED this _____ day of _____, 2024.

CONTRACTOR

_____
(Contractor Company Name)

By:

_____

_____
(Signee's Printed Name and Title)

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ATTACHMENT "B"
TO PROPOSAL FORM

GENERAL CONTRACTOR _____

SUB-CONTRACTOR LISTING: Submit the following Subcontractor's company names with the Proposal Form NO LATER THAN 2:00 PM local time on Bid Date, or at the Contractor's option, deliver to Owner with copy to Architect within twenty-four (24) hours of the scheduled Bid Opening.

02 4100 – DEMOLITION	Firm Name: _____ Location (City/ State): _____
03 2000 – CONCRETE REINFORCING	Firm Name: _____ Location (City/ State): _____
03 3000 – CAST IN PLACE CONCRETE	Firm Name: _____ Location (City/ State): _____
03 3010 – CAST IN PLACE CONCRETE FOR EXPOSED CONCRETE FLOORS	Firm Name: _____ Location (City/ State): _____
03 3660 – SEALED CONCRETE FLOOR	Firm Name: _____ Location (City/ State): _____
03 3680 – CONCRETE POLISHING	Firm Name: _____ Location (City/ State): _____

04 2000 – UNIT MASONRY	Firm Name: _____ Location (City/ State): _____
05 1200 – STRUCTURAL STEEL FRAMING	Firm Name: _____ Location (City/ State): _____
05 2100 – STEEL JOIST FRAMING	Firm Name: _____ Location (City/ State): _____
05 3100 – STEEL DECKING	Firm Name: _____ Location (City/ State): _____
05 4000 – COLD FORMED METAL FRAMING	Firm Name: _____ Location (City/ State): _____
05 5000 – METAL FABRICATIONS	Firm Name: _____ Location (City/ State): _____
05 5133 – METAL LADDERS	Firm Name: _____ Location (City/ State): _____
06 1000 – ROUGH CARPENTRY	Firm Name: _____

	Location (City/ State): _____
06 2000 – FINISH CARPENTRY	Firm Name: _____ Location (City/ State): _____
06 4000 – CUSTOM ARCHITECTURAL WOODWORK	Firm Name: _____ Location (City/ State): _____
07 0553 – FIRE AND SMOKE ASSEMBLY IDENTIFICATION	Firm Name: _____ Location (City/ State): _____
07 1400 – FLUID APPLIED AIR BARRIER	Firm Name: _____ Location (City/ State): _____
07 2100 – THERMAL INSULATION	Firm Name: _____ Location (City/ State): _____
07 2119 – FOAMED-IN-PLACE INSULATION	Firm Name: _____ Location (City/ State): _____
07 4213.01 – METAL WALL PANELS	Firm Name: _____ Location (City/ State): _____

07 4213.02 – METAL COMPOSITE MATERIAL (MCM) WALL PANELS	Firm Name: _____ Location (City/ State): _____
07 5416 – KEE MEMBRANE ROOFING	Firm Name: _____ Location (City/ State): _____
07 6200 – SHEET METAL FLASHING AND TRIM	Firm Name: _____ Location (City/ State): _____
07 7100 – ROOF SPECIALTIES	Firm Name: _____ Location (City/ State): _____
07 7123 – MANUFACTURED GUTTERS AND DOWNSPOUTS	Firm Name: _____ Location (City/ State): _____
07 7200 – ROOF ACCESSORIES	Firm Name: _____ Location (City/ State): _____
07 8400 – FIRESTOPPING	Firm Name: _____ Location (City/ State): _____
07 9200 – JOINT SEALERS	Firm Name: _____

	Location (City/ State): _____
08 1113 – STEEL DOORS AND FRAMES	Firm Name: _____ Location (City/ State): _____
08 1416 – FLUSH WOOD DOORS	Firm Name: _____ Location (City/ State): _____
08 3100 – ACCESS DOORS AND PANELS	Firm Name: _____ Location (City/ State): _____
08 4313 – ALUMINUM FRAMED STOREFRONTS	Firm Name: _____ Location (City/ State): _____
08 4413 – GLAZED ALUMINUM CURTAIN WALLS	Firm Name: _____ Location (City/ State): _____
08 7100 – DOOR HARDWARE	Firm Name: _____ Location (City/ State): _____
08 8000 - GLAZING	Firm Name: _____ Location (City/ State): _____

08 9100 - LOUVERS	Firm Name: _____ Location (City/ State): _____
09 2116 – GYPSUM BOARD ASSEMBLIES	Firm Name: _____ Location (City/ State): _____
09 3000 – TILING	Firm Name: _____ Location (City/ State): _____
09 5100 – ACOUSTICAL CEILINGS	Firm Name: _____ Location (City/ State): _____
09 6500 – RESILIENT FLOORING	Firm Name: _____ Location (City/ State): _____
09 6813 – TILE CARPETING	Firm Name: _____ Location (City/ State): _____
09 8400 – SOUND ABSORBING CEILING UNITS	Firm Name: _____ Location (City/ State): _____
09 9100 - PAINTING	Firm Name: _____

	Location (City/ State): _____
09 9600 – HIGH PERFORMANCE COATINGS	Firm Name: _____ Location (City/ State): _____
10 1100 – VISUAL DISPLAY UNITS	Firm Name: _____ Location (City/ State): _____
10 1400 – SIGNAGE	Firm Name: _____ Location (City/ State): _____
10 2113.19 – PLASTIC TOILET COMPARTMENTS	Firm Name: _____ Location (City/ State): _____
10 2600 – WALL AND DOOR PROTECTION	Firm Name: _____ Location (City/ State): _____
10 2800 – TOILET, BATH, AND LAUNDRY ACCESSORIES	Firm Name: _____ Location (City/ State): _____
10 4300 – EMERGENCY AID AND SECURITY SPECIALTIES	Firm Name: _____ Location (City/ State): _____

10 4400 – FIRE PROTECTION SPECIALTIES	Firm Name: _____ Location (City/ State): _____
10 7316 – METAL CANOPIES	Firm Name: _____ Location (City/ State): _____
10 7500 – FLAGPOLES	Firm Name: _____ Location (City/ State): _____
11 5213 – PROJECTION SCREENS	Firm Name: _____ Location (City/ State): _____
11 5225 – FLAT PANEL MOUNTS	Firm Name: _____ Location (City/ State): _____
12 2400 – ROLLER WINDOW SHADES SYSTEMS	Firm Name: _____ Location (City/ State): _____
12 3219 – LAMINATE CASEWORK	Firm Name: _____ Location (City/ State): _____
12 4813 – ENTRANCE FLOOR MATS AND FRAMES	Firm Name: _____

	Location (City/ State): _____
DIVISION 21 – FIRE SUPPRESSION	Firm Name: _____ Location (City/ State): _____
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DIVISION 23 – HVAC	Firm Name: _____ Location (City/ State): _____
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DIVISION 28 – ELECTRONIC SAFETY AND SECURITY	Firm Name: _____ Location (City/ State): _____
DIVISION 31 – EARTHWORK	Firm Name: _____ Location (City/ State): _____

31 3116 – TERMITE CONTROL	Firm Name: _____ Location (City/ State): _____
32 1216 – ASPHALT PAVING	Firm Name: _____ Location (City/ State): _____
32 1313 – CONCRETE PAVING	Firm Name: _____ Location (City/ State): _____
32 1400 – UNIT PAVING	Firm Name: _____ Location (City/ State): _____
32 1613 – CURBS AND GUTTERS	Firm Name: _____ Location (City/ State): _____
32 1723 – PAVEMENT MARKINGS	Firm Name: _____ Location (City/ State): _____
32 3113 – CHAIN LINK FENCES AND GATES	Firm Name: _____ Location (City/ State): _____
32 8000 – PERFORMANCE IRRIGATION	Firm Name: _____

	Location (City/ State): _____
32 9000 – LANDSCAPE WORK	Firm Name: _____ Location (City/ State): _____
33 1000 – WATER UTILITIES	Firm Name: _____ Location (City/ State): _____
33 3000 – SANITARY SEWER UTILITIES	Firm Name: _____ Location (City/ State): _____
33 4001 – STORM UTILITIES	Firm Name: _____ Location (City/ State): _____
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32 1613 – CURBS AND GUTTERS	Firm Name: _____ Location (City/ State): _____
32 1723 – PAVEMENT MARKINGS	Firm Name: _____ Location (City/ State): _____
32 3113 – CHAIN LINK FENCES AND GATES	Firm Name: _____ Location (City/ State): _____
32 8000 – PERFORMANCE IRRIGATION	Firm Name: _____

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	Firm Name: _____ Location (City/ State): _____
	Firm Name: _____ Location (City/ State): _____

SECTION 01 0150
SPECIAL CONDITIONS

1.01 TIME FOR COMPLETION OF WORK:

A. The Contractor may proceed to award sub-contracts, assemble materials, etc., after written "Notice To Proceed" with Work is given by the Owner. The Contractor's official time for construction to start on work shall be the date of the Owner's written "Notice to Proceed" with Work; and completion of the Work shall be within the number of consecutive calendar days or by the date(s) indicated on the Contractor's Proposal Form.
   1. Properly supervised work, per requirements, will be permitted on Saturdays and Sundays.

B. Acceptance of the completed Work of this Contract will be at a single date, and not in phases, unless otherwise indicated.

C. Nothing in the Contract Documents shall permit or be construed to permit payment to the Contractor for any extended overhead or profit due to completion of the project extending beyond the Contractual completion date. In no event shall the Owner or Architect be liable to the Contractor for damage due to any delay to any portion of the Work of this Contract.

D. Delays: See Article 8.3, and related articles of AIA General Conditions.

1.02 LIQUIDATED DAMAGES:

A. Actual damages for delay in completion may be impossible to determine, and the Contractor shall be liable for and the Owner shall deduct as liquidated damages from the final payment due the Contractor, the following, in addition to 6% per annum of the total contract amount:
   1. For each calendar day of delay in completion of any part of the work beyond the number of days specified, the sum of $250.00.
   2. In the event that work on this project is incomplete and ongoing after the contractual completion date, beginning at ten (10) additional days thereafter, the Owner will also charge the Contractor, an additional $250.00 per day, for the Owner's nominal reimbursement to the Architect for continued work on the project, which charges will continue until "Substantial Completion" is accomplished.

B. The submittal of a Bid and/or Proposal by any Contractor and their Subcontractors shall be construed as, in part, acknowledgement and acceptance of these provisions.

C. The Work of the Contract shall be Substantially Complete within ____ consecutive days from the Owner's official Notice to Proceed.

1.03 SITE RESTRICTIONS:

A. The limits of work and known restrictions are indicated on the Site Plan and various portions of the Drawings and the Project Manual.
   1. Refer also to Section 01 1000 - "Summary of The Work," for additional information and requirements.

1.04 PRE-BID CONFERENCE:

A. Refer to "Advertisement for Prequalification and Bids" and "Supplementary Instructions to Bidders," for additional information and requirements.

1.05 PRE-CONSTRUCTION CONFERENCES:

A. Refer to Section 01 3000 - "Administrative Requirements".

1.06 PRE-ROOFING CONFERENCE:

A. A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, building inspection officials (if required), General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable) and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.

B. The pre-roofing conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a

detailed review of the specifications, roof plans, roof deck information, flashing details and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

C. The following are to be accomplished during the conference:
   1. Review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that ay arise.
   2. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
   3. Establish roofing schedule and work methods that will prevent roof damage.
   4. Require that all roof penetrations and walls be in place prior to installing the roof.
   5. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
   6. Establish weather and working temperature conditions to which all parties must agree.
   7. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

D. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor and the Owner.

E. Refer to Section 01 3000 - "Administrative Requirements" for additional information and requirements.

1.07 CONTRACTOR ACCESS TO SITE:

A. The Contractor will have access to the site immediately upon receipt of the Owner's written Notice to Proceed with work. All routes of access to the site and gate locations by the Contractor or their subcontractors, are subject to approval by Owner, Architect, and other authorities having jurisdiction. Check site plan for location of work limits. Refer to Section 01 1000 - “Summary of The Work” and Section 01 5000 - “Temporary Facilities,” for additional information and requirements.

B. The Contractor shall be required to coordinate the Work of the project with the Owner’s activities, to the extent that the Work of this Contract has little or no effect on normal operations.

1.08 CONTRACTOR’S PLAN FOR CONSTRUCTION OF PROJECT:

A. Contractor shall prepare and submit within 7 days from award of contract to the Architect for review and approval a Bar Graph, indicating his proposed plan and sequence of operations to complete each phase of this project, on schedule as required by contract. This Bar Graph is not expected to be a Critical Path graph.
   1. Schedule should identify project milestones and expected durations.

1.09 CONTRACTOR JOB MEETINGS:

A. On-Site Meetings with Architect , and various trades, general contractors and subcontractors, shall be conducted by the Contractor as directed by the Architect for purpose of furthering the progress of the work, solving construction problems, and issuing instructions.

B. Refer to “Pre-construction Conferences” paragraph above, “General Conditions of the Contract”, and Section 01 3000 - "Administrative Requirements" for additional information and requirements.

1.10 STORED MATERIALS:

A. It is recognized that the size of the site is restrictive and that it may be necessary for the Contractor to store some materials for project at locations on the site, prior to removal or disposal. When such on site storage is necessary, comply with requirements of authorities having jurisdiction, including in part, on site retention of earth, storm water run-off, slopes of debris, earth, etc.

B. Store items to be incorporated in the Work in stable and secure manner, off of ground, separated by hardwood or treated wood blocking, and under cover or in storage building.
   1. Any materials found stored directly on ground or paving, in standing water, etc., will be rejected, immediately removed from site, and replaced with new materials at the Contractor’s expense.

2. Distribute materials around framing and the roof in such manner as to prevent any damage to structure, construction, improvements, etc.

C. Refer to Section 01 6000 - “Product Requirements”, for additional information and requirements for any off-site stored materials.

1.11 PROTECTION:

A. The Contractor shall provide and maintain adequate fencing and barricades, where indicated, and wherever required. Building entrances and exits shall remain unobstructed at all times when buildings are occupied.

B. The Contractor shall provide suitable protection for all employees, the public, students, children, users of other adjacent facilities, and the occupants of existing buildings at all times during the execution of and until the completion of the Work.
1. Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.

C. The Contractor shall avoid damage as a result of their operations, to the existing buildings, walks, pavement, curbs, grass, shrubbery, trees, utilities, adjoining property, etc., and shall at his/her own expense, completely repair any damage thereto caused by his operations. All repair work is subject to Architect’s approval, and that of its Owner.

D. Refer to Section 01 5000 - "Temporary Facilities and Controls" for additional information and requirements.

1.12 WORK LIMITS PROTECTION:

A. The Contractor shall locate all temporary buildings, storage of equipment, materials, etc., within a protected area to protect the public, and others from the construction activities. Type and location of such protection shall be as existing at the site, or if not existing or complete, as proposed and furnished by the Contractor, subject to acceptance of the Architect, Owner, and authorities having jurisdiction.

B. Refer to Section 01 5000 - "Temporary Facilities and Controls" for additional information and requirements.

1.13 EMPLOYMENT OF AND PAYMENT FOR TESTING SERVICES:

A. The following information regarding Employment of and Payment for Testing Services under the work of Specifications shall take precedence over any conflicting statements otherwise, which may have remained in the Project Manual after editing:
1. Initial testing required by the Contract Documents for Divisions 2 through 5, and Divisions 31-33 (except not utility systems testing) shall be provided by an independent testing agency selected, employed and paid by the Owner.
2. Initial testing required by the Contract Documents for all other testing and Divisions 6 through 26 shall be provided by a testing agency acceptable to the Owner, and selected, employed, and paid by the Contractor from his/her Contract amount.
3. Any retesting required (due to failure of initial testing to meet the requirements of the Contract Documents) shall be at the Contractor’s expense.
4. Any retesting required (due to questionable materials or construction methods, for verification purposes, and etc.) shall be at the Contractor’s expense when the results of such retesting indicate any work or materials do not comply with requirements of the Contract Documents. Otherwise, such retesting will be at Owner’s expense.
5. Any retesting under the above provisions shall be performed by the same Owner accepted testing agency.
6. Nothing in the Contract Documents shall prevent the Contractor from performing any other or additional Quality Control testing at his/her own expense, to verify compliance with the Bid and Contract Documents.

B. The Contractor shall be responsible for contacting and directions to the accepted testing agency and for any follow-up communications required, for all testing required by the Contract Documents.

C. No unsuitable or unsatisfactory existing soils or building materials (other than work in Contract) shall be removed without either the presence of or concurrence of and prior approval of the Architect and the accepted testing agency, so as to assure quality of the Work is maintained, and to verify quantities of any additional work under bid “Unit Prices”, for which the Contractor is due payment by the Owner.

D. The Contractor shall be responsible for contacting and directions to the accepted testing agency and for any follow-up communications required, for all testing required by the Contract Documents.

E. Refer to Section 01 4000 - "Quality Requirements" for additional information and requirements.

1.14 PROHIBITED MATERIALS:

A. ASBESTOS: All materials, equipment, components, accessories, and etc., installed in the work of this contract, both field installed and bought-out manufactured items from any source shall be 100-percent free of asbestos.

B. LEAD CONTENT: All water-bearing lines, water dispensing equipment, finish materials, and paint other than exposed exterior roof flashings, shall be 100-percent free of lead.

C. CALCIUM CHLORIDE: Calcium chloride and/or derivatives or additives thereof shall not be permitted in any concrete, concrete product, grout, masonry and/or mortar.

D. ENVIRONMENTAL REGULATIONS: All materials, their application, installation, and completion, shall comply with applicable environmental regulations, including in part, erosion, air-borne contaminants, and volatile organic compounds (VOC's).

E. FORMALDEHYDE: All insulation and other products shall be 100-percent free of formaldehyde.

1.15 PROHIBITED EQUIPMENT:

A. The elevated and framed floor slabs are not designed to accommodate heavy rolling point loads. Scissor lifts are not permitted on any elevated or framed slab during the construction of the project.

1.16 PROJECT SIGNS:

A. Provide, securely install and maintain prefinished metal signs on each side of each gate leaf and at 50'-0" o.c. maximum on street/public side of all construction fencing provided (if any).
   1. Copy: "NO TRESPASSING
   2. DANGER
   3. CONSTRUCTION AREA"
   4. Size:Approximately 1'-6" wide x 1'-0" high.

B. Provide other pedestrian and vehicular signs as necessary and required, in compliance with requirements of authorities having jurisdiction. Signs shall remain on site for duration of this Contract.

C. General Contractor may have a sign on his/her Construction Office and as needed for delivery directions only.

D. Subcontractors will not be allowed to post signs.

E. Refer to Section 01 5813 - "Project Signs" for additional information and requirements.

1.17 PERSONNEL EXPERIENCE AND SUPERINTENDENTS:

A. Subcontractors shall have no less than 5-years verifiable experience in their trade and no less than 5-years verifiable experience in their business enterprise contracting for work under this project; The type of work subcontracted for this project shall be the principal business of the Subcontractor.

B. Superintendents and foremen, or other individual in the lead or supervisory position for any portion of the Work under this Contract shall have no less than 7-years verifiable experience in performing the type of work they are responsible for.
   1. The Contractor shall submit resumes of work and project experience for their Superintendent and foremen, as soon as possible and at least within five calendar days of receipt of the Contract to be executed for the work, for review and acceptance by the Owner and Architect.
   2. If the Superintendent is replaced on the job after work begins, the same qualifications as above apply. Submit for review and acceptance by the Owner and Architect.

1.18 SUBMITTALS:

A. Submittal requirements are indicated throughout the Contract Documents, and the following supplements those requirements.
   1. Electronic Document Submittal Service will be used for administration of the Contract. See Section 01 3000 - Administrative Requirements.

2. Contractor will be required to make submittals for every item and product so indicated; Also upon request, for any additional or other item or products intended for use or incorporation in the Work.
   a. The Contractor shall submit to the Architect within 30 days of "Notice to Proceed", a complete listing of all required submittals, warranties, guarantees, close-out documents, and materials requiring extra or "attic" stock delivered to the Owner, for review and acceptance. Include for each item, the anticipated date of Submittal to the Architect. Re-submit until accepted or approved.
3. The Contractor shall review, mark all necessary changes, revisions, and questions; and then stamp, sign, approve, and submit to the Architect, all Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, and shall do so with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner, or of separate contractors.
   a. The Contractor shall not make submittals to the Architect which they have not reviewed, stamped, signed and approved by the Contractor; or in such case, no action will be taken by the Architect or their Consultants regarding that or those submittals.
4. The Contractor shall submit number of copies for review as indicated in Section 01 3000 - Administrative Requirements.
5. Review time will be limited to two weeks, except for more complex submittals, such as Structural, and Divisions 21-26.
6. Colors will not be selected until most or all submittals required have been received and reviewed. Actual color chip samples shall be required along with standard color selection papaerwork. No exceptions.
7. Submit test reports as required or otherwise requested, in the same quantity as other submittal data.
8. Contractor shall provide letter from Mechanical Contractor stating the Mechanical Contractor has coordinated all power requirements with the Electrical Contractor. Mechanical submittals will not be reviewed without receipt of this letter.
9. Contractor shall distribute reviewed submittals to all concerned and appropriate Subcontractors and Suppliers.
10. Contractor shall maintain 1-set of reviewed and approved submittals at his on-site job office.

B. Review and/or approval of submittals by the Architect, Owner and/or their Consultants shall not relieve the Contractor of his responsibility to comply with the requirements of the Contract Documents.
   1. Any proposed change in the Work shall be submitted separate from any other item during construction, with same documentation as pre-bid requests, or they will not be considered.
   2. No actual or proposed change shall be included in Shop Drawings or other Construction submittals, and none so included will be considered approved under any circumstances.
   3. Shop Drawings are communications between the Contractor and various suppliers, fabricators, and subcontractors. The design professional's role is to review the drawings to answer questions that arise about design intent.
   4. Even if a reviewed Shop Drawing or other Submittal has deviations from the original design and the Contract Documents, it in itself is not a Change Order and it is not, IN ITSELF, an approval of the change. Changes can only be approved by Change Order.
   5. Dimensions, quantities, and coordination remain the Contractor's responsibility.

C. Refer to Section 01 3000 - "Administrative Requirements" for additional information and requirements.

1.19 SITE MAINTENANCE:

A. The Owner will require all mud or debris resulting from this construction to be removed from streets, sidewalks, etc., by the Contractor as it appears, one or more times daily.

B. Trash, debris, etc., must be removed from the site as Contractor's trash cans, waste receptacles, etc., are filled. Same will not be allowed to accumulate or blow around the site, within the buildings, etc.

C. The Contractor shall be responsible for maintaining existing landscaping and lawns within and below any construction fencing, for the duration of the Work of the Contract, or until any such fencing is removed.

D. Refer to Sections 01 1000, 01 5000, 01 7000 and other locations in the Bid and Contract Documents for additional information and requirements.

1.20 INSURANCE AND SPECIAL PROVISIONS:

A. The Contractor and their insurer, by execution of the Contract, shall waive all rights of subrogation against "the Owner, the Architect, and their Consultants", and same shall be indicated on all insurance provided by the Contractor and each Subcontractor.

B. The Contractor and their insurer, and each Subcontractor, shall name "the Owner, Architect, and their Consultants", as additional named primary insureds on all insurance provided by the Contractor and each Subcontractor, except not for "Workers Compensation and Employers Liability".

C. Refer to "General Conditions" and other portions of the Bid and Contract Documents, for additional information and insurance requirements. Note that Builder's Risk insurance is required, as described in "General Conditions", as modified by "Supplementary Conditions".
   1. Extent of coverage required and/or any approval or acceptance of the insurance carried shall not act to modify the liability of the Contractor, nor to imply that the limits, features and/or coverages described are adequate to protect the interests or exposures of the Contractor.

D. The Contractor shall "hold harmless" and indemnify the Owner, Architect, and their Consultants from any claim or legal action resulting from any circumstances related to the Work of this project, including in part, payment of any legal or other expenses, fines, judgments, etc.

E. Insurance policies required by the Contract Documents shall not be canceled, altered, or changed, without first having given thirty (30) days written notice to the Owner, with a copy sent to the Architect, except ten(10) days written notice for non-payment of premium.
   1. Copies of all policies, endorsements, and insurance certificates, including new, renewed, altered, and/or changed during this Contract shall be delivered to the Owner within ten (10) days of effective date(s), with a copy sent to the Architect, by the Contractor.

F. Refer to General Conditions of the Contract for additional information and requirements regarding minimum insurance and indemnity requirements.

G. Special Provision: Nothing in this or other paragraphs of the Contract Documents shall create or give to third parties any claim or right of action beyond such as may legally exist irrespective of the Contract.

1.21 ACCESSIBILITY OF ALL COMPLETED WORK:

A. All products and installations of the Work of this Contract, shall be as designed by the fabricator, manufacturer, etc., and installed by the Contractor, Subcontractors, etc., so as to provide full accessibility to people with disabilities, unless specifically indicated otherwise. This shall include in part, the following:
   1. Mounting heights of all electrical devices, switches, etc., all designated plumbing fixtures, and their operation, in all areas except mechanical and electrical rooms, and service areas which are not accessible at any time to the public or Owner's administrative (not service or maintenance) personnel.
   2. Signage.
   3. Door operation and hardware.
   4. Elevator.
   5. Slip resistance of all completed flooring and walkway surfaces both interior and exterior.

B. Comply with the more stringent requirements of at least the following, either the latest edition or latest adopted edition of the locality, and all revisions and amendments thereto:
   1. American National Standards Institute (ANSI), ANSI A 117.1.
   2. D.O.J. ADA Standards for Accessible Design.
   3. International Building Code, as applicable at the project locale.

1.22 CONTRACTOR PROGRAMS AND CONDUCT OF PERSONNEL:

A. The Contractor shall implement programs and make literature available to all construction and administration personnel to encourage making this project a safe place to work, including in part the following requirements: A project site free of any substance abuse, which does not allow any consumption of alcohol, and which does not allow any work to be performed while under the influence of any debilitating substance.
   1. The Contractor and every Subcontractor shall have as part of their personnel, safety, substance abuse prevention, and/or quality programs, mandatory drug testing at pre-employment, post-accident, and at random during employees' tenure with their firms. Each such entity shall be prepared to provide non-

confidential verification to the Owner that such testing is consistently on-going, upon Owner's request for same.

B. Programs shall be as acceptable to or recommended by one or more of the following:
   1. Contractor's Underwriter for Worker's Compensation or liability insurance.
   2. OSHA.
   3. Associated General Contractors.
   4. U.S. Department of Defense, Corps of Engineers, or Veterans Administration.

C. Conduct of all personnel employed for the Work of this project shall be held to a high standard and shall not be offensive to others on or around the site, including in part, pedestrians, the public, the Owner, Owner's Consultants, etc.
   1. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representative named in the front of this Project Manual, inspecting authorities with jurisdiction, and the Architect; In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
   2. The Contractor's personnel and Subcontractors shall not enter the Owner's building, nor use the Owner's telephones (except in emergencies), or the Owner's restrooms.

D. The Contractor shall immediately dismiss and escort off of the project site, any personnel who are obviously under the influence of alcohol or other debilitating substance, and any personnel exhibiting offensive behavior as described above or by law or by local statute or regulations of authorities having jurisdiction.

1.23 WORK BY OTHERS:

A. The following items of work are to be provided by others, and are Not in Contract (N.I.C.). The Contractor will be required to coordinate with the Owner as necessary to accommodate provisions for these items.
   1. Movable furniture, furnishings, office equipment, library equipment, and movable library shelving unless otherwise indicated.
   2. Listed Equipment, residential appliances, and items of Alternate work not accepted at this time, and/or indicated "Not In Contract", "N.I.C.", "Future", and/or similar indication.
      a. Unless otherwise indicated, coordination, locating, and providing rough-ins for all power, water supply, gas, drains, drain lines, condensate drain outlet, and other utilities required for such equipment, casework, etc., and preparation required for the addition of future finishes (same as level of finish required for the finishes included in Bid, just prior to finishes being added), shall be included in Base Bid;

B. Refer to Section 01 1000 - "Summary of The Work" for additional information and requirements.

1.24 INSPECTIONS:

A. See Section 01 3000 - Administrative Requirements for information on Scheduling of Inspections, and Minimum Requirements for Required Inspections.

1.25 USER FEES:

A. The Contractor is hereby advised that, if applicable, any administrative fees in the fort of a Permit Fee shall be paid by the Contractor.
   1. It is the Contractor's responsiblity to obtain all applicable permits associated with the work of the contract.

END OF SECTION

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SECTION 01 1000.01
ELECTRONIC FILE CONVERSION AND TRANSFER AGREEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electronic file conversion and transfer agreement and procedures.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including Supplementary Conditions and Division 01 Specification sections, apply to the work of this Section.

1.03 LISTED DOCUMENTS

A. GMC Electronic File Conversion and Transfer Agreement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 1000
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND GENERAL INFORMATION

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.02 PROJECT/WORK IDENTIFICATION

A. General: Project name is "RAINBOW CITY RECREATION CENTER, for The City of Rainbow City, Alabama", as shown on the Contract Documents prepared by Goodwyn Mills Cawood, LLC., dated May 28, 2024.

B. Contract Documents indicate the work of the Contract and related requirements and conditions that have an impact on the project.

C. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions (if any), the Project Manual, Technical Specification Sections, Drawings, Addenda and modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and the Drawings, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.

D. Abbreviated Written Summary: Briefly and without force and effect upon the contract documents, the Work of the Contract can be summarized as follows:
   1. The Work includes construction of new building, and related work, as required to complete the facilities as indicated on the Drawings and in the Project Manual.

1.03 CONTRACTOR USE OF PREMISES

A. General: During the entire construction period the Contractor shall have the exclusive use of the premises for construction operations, including full use of the site as shown on the Drawings.
   1. Limitations of exclusive use of the site:
      a. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to applicable rules and regulations affecting the work while engaged in project construction. See site plan for egress and ingress to site, or if not indicated, same shall be as designated by the Owner.
      b. Keep existing public roads, driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials. Remove dirt, mud, debris, etc., from site, sidewalks, streets, and public right-of-way as it occurs.
      c. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off site in a fully bonded and insured facility acceptable to the Owner, with all items stored clearly identified as being assigned to this project.
      d. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running, or the ignition key in place.
      e. The Owner, and their representatives, the Architect and their Consultants, as well as authorities having jurisdiction will require site accessibility for inspections, observations, and perhaps other purposes, related to the planned new construction. The Contractor shall assist in such accessibility, to at least the point of providing and maintaining reasonably accessible dry paths to work in progress.
      f. Construction operations shall not effect in any manner, the on-going operations of the Owner, immediately adjacent facilities, adjacent property owners or businesses, or others. Refer to Division 1 Section “Special Conditions” for additional information and requirements regarding coordination with Owner’s activities.
         1) Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.

g. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representatives named in the front of this Project Manual, Consultants employed, inspecting authorities with jurisdiction, and the Architect. In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
h. Parking on-site, if any, shall be limited to the "staging areas" indicated on the Drawings, or if not indicated, as mutually agreed between the Owner, Architect, and Contractor at the Pre-Construction Conference.
i. Smoking or other use of tobacco products shall not be permitted within the Owner's facilities or on roofs.
j. The use or presence of alcohol and/or other debilitating substances shall not be permitted on the project site.
k. Firearms and/or other weapons shall not be permitted on the project site.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 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 construed or interpreted as to provide a Contract time extension, due to use or non-use of any Allowance amount.
   2. Nothing in the Bid or Contract Documents shall be so construed or interpreted as to allow unused Allowances or any portion thereof, nor any overhead and profit therefor to be retained by or paid to the Contractor.
      a. Full amount of unused allowances shall be returned to the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF ALLOWANCES:

A. **Allowance No. 01 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEM (Cash Allowance)**
1. Allow a lump sum price of ONE-HUNDRED THOUSAND DOLLARS ($100,000) for work associated ith the purchase and installation of an Emergency Responder Radio Coverage System if found to be required after testing of the facility.
2. See Section 28 7800 - Emergency Radio Responder Coverage System for requirements. Costs associated with testing to identify if the system is required shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid and not as part of Allowance.

B. **Allowance No. 02 - PERMANENT CORES AND KEYS (Cash Allowance)**
1. Allow a lump sum price of TEN THOUSAND DOLLARS ($10,000) for purchase of permanent keyed cores and keys, as directed by owner. Cores to be used in lock cylinder housings supplied under Division 08 Section 08 7100–Finish Hardware.
2. See Section 08 7100 - Door Hardware for requirements.
3. Provide each core with one operating key. New key system shall include five (5) master keys per master key group created, two (2) permanent control keys and five (5) grand master keys and one-hundred (100) blanks.
4. Installation of the permanent cores, including installation material costs, shall be included in the Base Bid, and not as part of Allowance.
5. Include overhead and profit in Base Bid and not as part of Allowance.

C. **Allowance No. 3 - MASONRY MORTAR (Cash Allowance)**
1. Allow a unit cost of $14.00 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.) with the exception of the mortar of the interior brick masonry walls 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. **Allowance No. 4 - BRICK MASONRY:\ (Cash Allowance)**
1. Field Brick & Brick Pavers: Allow a unit cost of $500.00 per thousand for brick units, including purchase, delivery to the job site, and all related costs. Colors to be selected by Architect.
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.

E. **Allowance No. 5 - EXTERIOR BUILDING SIGN (Cash Allowance)**
1. Allow a lump sum price of FOURTY-FIVE THOUSAND DOLLARS ($45,000) for work assocaited with the design, purchase, and installation of an exterior building sign as indicated in the Drawings.
2. Installation and installation materials costs shall be included in Allowance, and not as a part of the Base Bid.
3. Include overhead and profit in Base Bid.
4. Electrical provisions outlined in the Drawings are to be included in the Base Bid, and not as a part of the Allowance.

F. **Allowance No. 06 - ACCESS CONTROL SYSTEM (Cash Allowance)**

1. Allow a lump sum price of TWENTY-FIVE THOUSAND DOLLARS ($25,000) for work associated with the purchase and installation of the access control system to be installed in the facility.
2. The Access Control System itself (including readers, cabling, head-end equipment, and installation) is not specified in the Contract Documents, however certain provisions including raceways and power service are included in the scope of work and shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid and not as part of Allowance.

G. **Allowance No. 07 - SECURITY CAMERA SYSTEM (Cash Allowance)**
1. Allow a lump sum price of TWENTY-FIVE THOUSAND DOLLARS ($25,000) for work associated with the purchase and installation of a security camera system to be installed in the facility.
2. The Security Camera System itself (including cameras, head-end equipment, and installation) is not specified in the Contract Documents, but certain provisions including raceways, power service, and cabling are included in the scope of work and shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid and not as part of Allowance.

H. **Allowance No. 08 - AUDIO VISUAL / LOW VOLTAGE CONTINGENCY (Cash Allowance)**
1. Allow a lump sum price of ONE-HUNDRED THOUSAND DOLLARS ($100,000) as an Audio Visual / Low Voltage Contingency Allowance.
2. Include overhead and profit in Base Bid and not as part of Allowance.

I. **Allowance No. 09 - CONTINGENCY (Cash Allowance)**
1. Allow a lump sum price of ONE HUNDRED THOUSAND DOLLARS ($100,000) as a Contingency Allowance.
2. Include overhead and profit in Base Bid and not as part of Allowance.

J. **Allowance No. 10 - UNDERCUT AND BACKFILL IN BUILDING CONTROL AREA**
1. In accordance with Section 01 2200 - Unit Prices and Section 31 2000 - Earth Moving, include an Allowance for the quantity identified. The Allowance value will be adjusted up or down based on the actual quantity of the Work.
2. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
3. Calculating Allowance No. 10:
   a. Unit Price Item A: Undercut and Backfill in Building Control Area
   b. Quantity of TWO HUNDRED FIFTY (250) Cubic Yards (CY)
   c. Unit Price for each CY $_____.
   d. Total Allowance No. 10 Value (b x c): $ _____.

K. **Allowance No. 11 - UNDERCUT AND BACKFILL IN PAVEMENT CONTROL AREA**
1. In accordance with Section 01 2200 - Unit Prices and Section 31 2000 - Earth Moving, include an Allowance for the quantity identified. Undercut and Backfill illustrated in the drawings and specified herein shall be included in the Base Bid, not as part of Allowance.The Allowance value will be adjusted up or down based on the actual quantity of the Work.
2. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
3. Calculating Allowance No. 11:
   a. Unit Price Item B: Undercut and Backfill in Pavement Control Area
   b. Quantity of TWO HUNDRED FIFTY (250) Cubic Yards (CY)
   c. Unit Price for each CY $_____.
   d. Total Allowance No. 11 Value (b x c): $ _____.

END OF SECTION

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SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 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 construed or interpreted as to provide a Contract time extension, due to use or non-use of any Allowance amount.
   2. Nothing in the Bid or Contract Documents shall be so construed or interpreted as to allow unused Allowances or any portion thereof, nor any overhead and profit therefor to be retained by or paid to the Contractor.
      a. Full amount of unused allowances shall be returned to the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF ALLOWANCES:

A. **Allowance No. 01 - EMERGENCY RESPONDER RADIO COVERAGE SYSTEM (Cash Allowance)**
1. Allow a lump sum price of ONE-HUNDRED THOUSAND DOLLARS ($100,000) for work associated ith the purchase and installation of an Emergency Responder Radio Coverage System if found to be required after testing of the facility.
2. See Section 28 7800 - Emergency Radio Responder Coverage System for requirements. Costs associated with testing to identify if the system is required shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid and not as part of Allowance.

B. **Allowance No. 02 - PERMANENT CORES AND KEYS (Cash Allowance)**
1. Allow a lump sum price of TEN THOUSAND DOLLARS ($10,000) for purchase of permanent keyed cores and keys, as directed by owner. Cores to be used in lock cylinder housings supplied under Division 08 Section 08 7100–Finish Hardware.
2. See Section 08 7100 - Door Hardware for requirements.
3. Provide each core with one operating key. New key system shall include five (5) master keys per master key group created, two (2) permanent control keys and five (5) grand master keys and one-hundred (100) blanks.
4. Installation of the permanent cores, including installation material costs, shall be included in the Base Bid, and not as part of Allowance.
5. Include overhead and profit in Base Bid and not as part of Allowance.

C. **Allowance No. 3 - MASONRY MORTAR (Cash Allowance)**
1. Allow a unit cost of $14.00 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.) with the exception of the mortar of the interior brick masonry walls 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. **Allowance No. 4 - BRICK MASONRY:\ (Cash Allowance)**
1. Field Brick & Brick Pavers: Allow a unit cost of $500.00 per thousand for brick units, including purchase, delivery to the job site, and all related costs. Colors to be selected by Architect.
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.

E. **Allowance No. 5 - EXTERIOR BUILDING SIGN (Cash Allowance)**
1. Allow a lump sum price of FOURTY-FIVE THOUSAND DOLLARS ($45,000) for work assocaited with the design, purchase, and installation of an exterior building sign as indicated in the Drawings.
2. Installation and installation materials costs shall be included in Allowance, and not as a part of the Base Bid.
3. Include overhead and profit in Base Bid.
4. Electrical provisions outlined in the Drawings are to be included in the Base Bid, and not as a part of the Allowance.

F. **Allowance No. 06 - ACCESS CONTROL SYSTEM (Cash Allowance)**

1. Allow a lump sum price of TWENTY-FIVE THOUSAND DOLLARS ($25,000) for work associated with the purchase and installation of the access control system to be installed in the facility.
2. The Access Control System itself (including readers, cabling, head-end equipment, and installation) is not specified in the Contract Documents, however certain provisions including raceways and power service are included in the scope of work and shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid and not as part of Allowance.

G. **Allowance No. 07 - SECURITY CAMERA SYSTEM (Cash Allowance)**
1. Allow a lump sum price of TWENTY-FIVE THOUSAND DOLLARS ($25,000) for work associated with the purchase and installation of a security camera system to be installed in the facility.
2. The Security Camera System itself (including cameras, head-end equipment, and installation) is not specified in the Contract Documents, but certain provisions including raceways, power service, and cabling are included in the scope of work and shall be included in the Base Bid, and NOT as part of Allowance.
3. Include overhead and profit in Base Bid and not as part of Allowance.

H. **Allowance No. 08 - AUDIO VISUAL / LOW VOLTAGE CONTINGENCY (Cash Allowance)**
1. Allow a lump sum price of ONE-HUNDRED THOUSAND DOLLARS ($100,000) as an Audio Visual / Low Voltage Contingency Allowance.
2. Include overhead and profit in Base Bid and not as part of Allowance.

I. **Allowance No. 09 - CONTINGENCY (Cash Allowance)**
1. Allow a lump sum price of ONE HUNDRED THOUSAND DOLLARS ($100,000) as a Contingency Allowance.
2. Include overhead and profit in Base Bid and not as part of Allowance.

J. **Allowance No. 10 - UNDERCUT AND BACKFILL IN BUILDING CONTROL AREA**
1. In accordance with Section 01 2200 - Unit Prices and Section 31 2000 - Earth Moving, include an Allowance for the quantity identified. The Allowance value will be adjusted up or down based on the actual quantity of the Work.
2. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
3. Calculating Allowance No. 10:
   a. Unit Price Item A: Undercut and Backfill in Building Control Area
   b. Quantity of TWO HUNDRED FIFTY (250) Cubic Yards (CY)
   c. Unit Price for each CY $_____.
   d. Total Allowance No. 10 Value (b x c): $ _____.

K. **Allowance No. 11 - UNDERCUT AND BACKFILL IN PAVEMENT CONTROL AREA**
1. In accordance with Section 01 2200 - Unit Prices and Section 31 2000 - Earth Moving, include an Allowance for the quantity identified. Undercut and Backfill illustrated in the drawings and specified herein shall be included in the Base Bid, not as part of Allowance.The Allowance value will be adjusted up or down based on the actual quantity of the Work.
2. See Section 01 2200 - Unit Prices for costs to be included and procedures for payment of Unit Price work.
3. Calculating Allowance No. 11:
   a. Unit Price Item B: Undercut and Backfill in Pavement Control Area
   b. Quantity of TWO HUNDRED FIFTY (250) Cubic Yards (CY)
   c. Unit Price for each CY $_____.
   d. Total Allowance No. 11 Value (b x c): $ _____.

END OF SECTION

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SECTION 01 2200
UNIT PRICES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for unit prices.
   1. A unit price is an amount proposed by Bidders and stated on "Attachment A to Proposal Form", as a price per unit of measurement for materials and/or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased, in accordance the General Conditions and/or other provisions of the Bid and Contract Documents.
   2. Unit prices shall include all necessary material, labor, fees, layout, supervision (field and home office), general expenses, insurance, bonds, overhead, profit and applicable taxes, for unit item of work in place.
   3. Refer to other Division 1 Sections and individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of approval, verification, measurement and payment for unit prices are specified in those sections.

B. Related work specified elsewhere includes:
   1. Section 01 0150 - Special Conditions.
   2. Division 2 - Existing Conditions Sections.
   3. Divisions 31-35 - Site Work Divisions.

C. Schedule:
   1. A "Unit Price Schedule" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.
   2. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 ITEMIZED UNIT PRICE SCHEDULE

A. Item No. A - Undercut & Backfill in Building Control Areas:
   1. Description: Undercutting below planned subgrade in building control areas, and at least 10-feet beyond, as required due to careful inspection by probing, proofrolling, and testing shall be paid on a unit price basis per cubic yard of undercut. Unit price shall include excavation and legal off-site disposal of unsuitable material and replacement with compacted controlled fill back to subgrade elevation in cuts and back to original grade in fills in accordance with Section 31 3200 - "Earth Moving". This shall not apply to previously prepared areas of the site that may become unstable due to construction traffic, rain, etc.
   2. Unit of Measure: Cubic Yard (CY) of unsuitable material.

B. Item No. B - Undercut & Backfill in Non-Building Control Areas.
   1. Description: Undercutting below planned subgrade in all areas not included in the building control areas as required due to careful inspection by probing, proofrollling, and testing shall be paid on a unit price basis per cubic yard of undercut. Unit price shall include excavation and legal off-site disposal of unsuitable material and replacement with compacted controlled fill back to subgrade elevation in cuts and back to original grade in fills in accordance with Section 31 2000 - "Earth Moving". This shall not apply to previously prepared areas of the site that may become unstable due to construction traffic, rain, etc.
   2. Unit of Measure: Cubic Yard (CY) of unsuitable material.

END OF SECTION

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SECTION 01 2300
ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Description of alternates.

B. Procedures for pricing alternates.

1.02 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Addition of the Exterior Amphitheater:
   1. Base Bid Item: Construction of the project according to the documents as issued with the exclusion of the Exterior Amphitheater and associated Work.
   2. Alternative Item: This alternate item should include the addition of the Exterior Amphitheater with all required utilities, grading, drainage, and coordination outlined in the Drawings.

B. Alternate No. 2 - Removal of the Splash Pad as an OFOI Item:
   1. Base Bid Item: Construction of the project according to the documents as issued with the inclusion of the splash pad components as Owner Furnished Owner Installed items. The Base Bid should include all associated Work outlined in the Drawings to provide all hardscape, grading and drainage provisions for the splash pad to be completed as an Owner Furnished Owner Installed item.
   2. Alternative Item: This alternate item should include the addition of the underground plumbing requirements for the splash pad, as well as the inclusion of all Work required for hardscape, grading, and drainage outlined in the Drawings. The intent of this Alternate is to provided the necessary below grade utilities for the Owner to install the splash pad in the future and meet all current regulatory requirements with the Work performed under this Contract.

C. Alternate No. 3 - Removal of the Playground as an OFOI Item:
   1. Base Bid Item: Construction of the project according to the documents as issued with the inclusion of the playground components as Owner Furnished Owner Installed items. The Base Bid should include all associated Work outlined in the Drawings to provide all hardscape, grading, and drainage provisions for the playground to be completed as an Owner Furnished Owner Installed item.
   2. Alternative Item: This alternate item should include the addition of the underground plumbing requirements for the splash pad, as well as the inclusion of all Work required for hardscape, grading, and drainage outlined in the Drawings. The intent of this Alternate is to provided the necessary below site provisions for the Owner to install the playground in the future and meet all current regulatory requirements with the Work performed under this Contract.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 2900
PAYMENT PROCEDURES

PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.03 DEFINITIONS

A. Schedule of Values: A statement acceptable to the Owner and Architect furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.04 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor’s Construction Schedule.
   2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Contractor's name and address.
      c. Date of submittal.
   2. Submit draft of Schedule of Values that will accompany Application for Payment.
   3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that affect value.
      g. Dollar value.
         1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
   4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
   5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.05 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by approving authority and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use Application and Certificate for Payment form stipulated in front-end documents as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Approving authority will return incomplete applications without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
   1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if not final).
   4. Products list.
   5. Schedule of unit prices.
   6. Submittals Schedule (preliminary if not final).

7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.
16. Initial settlement survey and damage report if required.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. Contractor's Affidavits of Payment of Debts and Claims, Release of Liens, and Consent of Surety to Final Payment, if applicable.
5. Evidence that claims have been settled.
6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Requests For Information.

C. Preconstruction meeting.

D. Progress meetings.

E. Submittals for review, information, and project closeout.

F. Number of copies of submittals.

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures (Including Submittal Numbering/Tracking Guide and form for Transmittal).

I. Inspections.

1.02 RELATED SECTIONS

A. Section 01 0150 - Special Conditions: Additional Administrative and Submittal Requirements.

B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

A. CSI/CSC Form 12.1A - Submittal Transmittal; Current Edition.

1.04 PROJECT COORDINATION

A. Project Coordinator: Contractor's Project Manager.

B. Cooperate with the Owner and Architect in allocation of mobilization areas of site; for field offices and sheds, for traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Owner and Architect.

D. Comply with Owner and Architect's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Owner and Architect for use of temporary utilities and construction facilities.

F. Coordinate field engineering and layout work under instructions of the Owner and Architect.

G. Make the following types of submittals to Architect:
   1. Schedule of Submittals.
   2. Requests for interpretation.
   3. Requests for substitution.
   4. Shop drawings, product data, and samples.
   5. Test and inspection reports.
   6. Design data.
   7. Manufacturer's instructions and field reports.
   8. Applications for payment and change order requests.
   9. Progress schedules.
   10. Coordination drawings.
   11. Correction Punch List and Final Correction Punch List for Substantial Completion.
   12. Closeout submittals.

1.05 PROJECT COORDINATION (WITH CM)

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
1. Schedule of Submittals.
2. Requests for Interpretation.
3. Requests for substitution.
4. Shop drawings, product data, and samples.
5. Test and inspection reports.
6. Design data.
7. Manufacturer's instructions and field reports.
8. Applications for payment and change order requests.
9. Progress schedules.
10. Coordination drawings.
11. Correction Punch List and Final Correction Punch List for Substantial Completion.
12. Closeout submittals.

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 | Construction Management (tel: 1-866-477-6267): www.procore.com

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 REQUEST FOR INFORMATION

A. All Pre-Bid Questions, or Requests for Information must be submitted through a prequalified General Contractor via email to the Architect's Project Manager, with a copy to Kayla Thomas (kayla.thomas@gmcnetwork.com). Pre-Bid Questions will be accepted up to 48 hours prior to Bid Opening.

B. Send requests for information (RFI's) to Architect's Project Manager and administrative assistant, following the example form included at the end of this section.

C. Sequentially number the Requests for Information (RFI), and date accordingly.

D. Explanations and interpretations will be issued via Addendum.

E. After award of the Bid, a Request for Information (RFI), when submitted to the Architect, may result in an Architect's Supplemental Instruction (ASI), Request for Proposal (RFP), or Construction Change Directive (CCD) prior to the issuance of a Change Order.

3.03 PRECONSTRUCTION CONFERENCES

A. Prior to commencing any work on the project, a pre-construction conference shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the project. Time and date of said conference shall be established by the Architect after award of construction contract.

B. Architect will schedule a meeting after Notice of Award.

C. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

D. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.
   8. Other items: To be announced.

E. Similarly, prior to commencing any major portion of the Work of the project, preconstruction conferences shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the individual major portions of project. Time and date of said conferences shall be established by the General Contractor, and the Architect, Owner, and appropriate Consultants shall be advised in writing of times and dates, by the General Contractor.
   1. “Major portion” may be defined as work items for each Subcontractor working on site, and shall include in part, but not be limited to, earthwork, sitework, site utilities, concrete work, masonry, Division 5, roof framing and Division 6, insulation, roofing systems, finishes, specialties, casework, mechanical, plumbing, and electrical.

F. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. The Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made. Emails to Project Team are acceptable.

D. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

E. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

3.05 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

C. Do Not install above ceiling work prior to preparation, submission, and approval of the above ceiling Coordination Drawings .

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 Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
   a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
   b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to Owner.
3. Prepare using software provided by the Electronic Document Submittal Service.
4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
   a. Approval of submittals (use procedures specified elsewhere in this section).
   b. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
   c. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
   a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.

3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.07 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
2. Coordinate with Contractor's construction schedule and schedule of values.
3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.08 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, using the submittal numbering tracking system, for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.09 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. No action will be taken.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS (WHEN ELECTRONIC DOCUMENT SUBMITTAL SERVICE IS USED)

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

C. Samples: Submit no less than 3-each of any sample or color chart which is required or otherwise requested, unless more are required in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

D. Refer to Section 01 0150 - "Special Conditions" for additional information and requirements.

3.12 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for related items.
   2. Transmit using approved form.
      a. Use Form CSI/CSC Form 12.1A.
      b. Use Contractor's form, subject to prior approval by Architect.
      c. Use form generated by Electronic Document Submittal Service software.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Deliver submittals to Architect at business address.
      b. Deliver submittals to Construction Manager at business address.
      c. Deliver submittals to _____ at business address.
      d. Send submittals in electronic format via email to Architect.
      e. Upload submittals in electronic form to Electronic Document Submittal Service website.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for Contractor and Architect review stamps.
   10. When revised for resubmission, identify all changes made since previous submission.
   11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   13. Submittals not requested will not be recognized or processed.
   14. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.

2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.
5. Submit sustainable design reporting submittals under separate cover.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Transmit each submittal with approved form.

E. Transmit each submittal. Sequentially number each transmittal form according to the example shown on the sample Transmittal form provided at the end of this Section. Include the date, project number and name along with number of copies submitted.

F. Deliver submittals to Architect at business address to the attention of the Contract Administration Coordinator.

G. A Submittal Schedule must be submitted and approved by Architect prior to review of any and all submittals.

3.13 SCHEDULING OF INSPECTIONS

A. Contact the design professional by email of the date the project will be ready for an inspection.

B. The design professional will contact the Local Building Inspector to schedule the first available date for the inspection. Inspections must be requested 14 days in advance.

C. After Building Inspector notifies design professional of time of inspection, design professional will notify Contractor, and Owner, copying Building Inspector.

D. Cancellations of any scheduled inspection must be received in writing by email no less than 48 hours prior to the scheduled inspection. The email shall be sent to the Contractor, Building Inspector, and Owner. If an inspection is cancelled, it will be rescheduled subject to Building Inspector's availability.

3.14 MINIMUM REQUIREMENTS FOR REQUIRED INSPECTIONS

A. Use the following minimum requirements to help determine if a project is ready for required inspection:

B. PRE-CONSTRUCTION CONFERENCE.
1. Required Attendees: Contractor, Owner, Architect, Major Subcontractors.
2. Inspection Requirements:
a. Signed construction contract.
b. Verification of payment of permit fee.
c. Contractor's Statement of Responsibility and Quality Assurance Plan (for storm shelter).
d. Fire Alarm Contractor's Certification (from State Fire Marshall).
e. ADEM permit, if more than 1 acre of land is disturbed.

C. PRE-ROOFING CONFERENCE.
1. Required Attendees: Contractor, Owner, Architect, Roofing Subcontractor, Roofing Manufacturer's Representative.
2. Inspection Requirements:
a. Roofing submittals must be approved by Architect prior to pre-roofing conference.
b. Roofing manufacturer must provide documentation that roof design and roofing materials meet code requirements for wind uplift and impact resistance.
c. Copy of sample roofing warranty.

D. ABOVE-CEILING INSPECTION.
1. Required Attendees: Contractor, Owner, Architect, MEP Engineers, Major Subcontractors.
2. Inspection Requirements:
a. All work must be completed except for installation of ceiling tiles and/or hard ceilings.
b. Space must be conditioned.

c. Permanent power must be connected unless otherwise arranged with the Building Inspector.
d. Grease duct must be inspected and approved by the Building Inspector prior to fire wrapping and Above-Ceiling Inspection.

E. LIFE SAFETY INSPECTIONS AND FINAL INSPECTIONS.
1. Required Attendees: Contractor, Owner, Architect, Engineers, Major Subcontractors, Local Fire Marshall.
2. Inspection Requirements:
a. Fire alarm certification.
b. Kitchen hood fire suppression system certification.
c. General Contractor's 5-Year Roofing Warranty (DCM Form C-9).
d. Roofing manufacturer's guaranty.
e. Above ground and below ground sprinkler certifications.
f. Completed Certificate of Structural Engineers Observations for storm shelters.
g. Emergency and exit lighting tests.
h. Fire alarm must be monitored.
i. Elevator Inspection completed and Certificate of Operation provided by the State of Alabama Department of Labor.
j. Boiler/Vessels Inspection completed and Certificate of Operation provided by the State of Alabama Department of Labor.
k. Flush test for underground sprinkler lines (witnessed by local fire marshall, fire chief and/or Building Inspector).
l. Flush/pressure test for new and/or existing fire hydrants.
m. Must have clear egress/access and emergency (for first responders) access to building.
n. Must have ADA access completed.

F. YEAR-END INSPECTIONS.
1. Required Attendees: Contractor, Owner, Architect, Engineers and/or Major subcontractors may also be required to attend.
2. Inspection Requirements:
a. Owner's list of documented warranty items.

END OF SECTION

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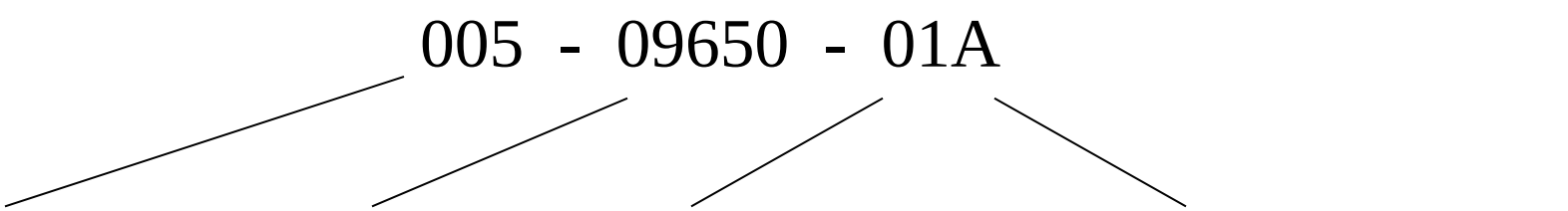
SUBMITTAL NUMBERING / TRACKING



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INCLUDE ARCHITECT'S PROJECT NUMBER ON ALL SUBMITTAL TRANSMITTALS

**** Architect's Project No. & Name: ABHM230021 RAINBOW CITY RECREATION CENTER**
Rainbow City, Alabama

REQUEST FOR INFORMATION

RFI No. _____

DATE: _____ PROJECT NAME: _____

GM&C PROJECT No._____

FROM: _____ PROJECT MANAGER: _____

_____ GOODWYN, MILLS & CAWOOD, INC.

_____ 2701 First Avenue South, Suite 100

_____ Birmingham, AL 35233

REQUEST:

SIGNATURE: _____

SUGGESTION:

RESPONSE: ROUTING:_____ DATE REC'D: _____

SIGNATURE: _____ DATE RET'D: _____

DISTRIBUTION: O Contract Administrator O Consultant O _____ O _____ O _____

*** SEND THIS FORM TO THE CONTRACT ADMINISTRATION COORDINATOR ***

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

1.02 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2016.

1.03 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Submit updated schedule with each Application for Payment.

D. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

1.04 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.05 SCHEDULE FORMAT

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

B. Diagram Sheet Size: Maximum 22 x 17 inches.

C. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Include conferences and meetings in schedule.

F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

H. Indicate delivery dates for owner-furnished products.

I. Provide legend for symbols and abbreviations used.

J. Show total float for each construction activity.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 15 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
   11. Monetary value of activity, keyed to Schedule of Values.
   12. Percentage of activity completed.
   13. Responsibility.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.
   3. By responsibility in order of earliest possible start date.
   4. In order of latest allowable start dates.
   5. In order of latest allowable finish dates.
   6. Contractor's periodic payment request sorted by Schedule of Values listings.
   7. Listing of basic input data that generates the report.
   8. Listing of activities on the critical path.

3.05 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.

3.06 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.07 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

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TRANSMITTAL

No. _____

DATE: _____

FROM: _____

_____

_____

_____

PROJECT: _____

GM&C PROJECT No. _____

PROJECT MANAGER: _____

Goodwyn Mills Cawood, LLC.

2400 5th Avenue South, Birmingham, AL 35233

Birmingham, AL 35233

Shop Drawing / Submittal No. (see example below) Description

Copies	Submittal Number	Description

RESPONSE: ROUTING: _____ DATE REC'D: _____

SIGNATURE: _____ DATE RET'D: _____

Shop Drawing / Submittal Number Example 005 - 09650 - 01A

- 005 — Consecutive submittal for Project
- 09650 — Specification Section
- 01 — First submittal for spec section; 02 = 2nd submittal for spec section
- A = First time submitted for that section/item.; B = Indicates resubmittal; C = Third submittal for same item

*** SEND THIS FORM TO THE CONTRACT ADMINISTRATION COORDINATOR ***

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Testing and inspection agencies and services.

D. Control of installation.

E. Mock-ups.

F. Tolerances.

G. Manufacturers' field services.

H. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4223 - Reference Standards and Definitions.

C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 DEFINITIONS

A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

1.04 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2024.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: For integrated exterior and interior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions

3. Fire Protection: Sprinkler shop drawings shall include PE stamp of Professional Engineer licensed in the state in which the project is located.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. Schedule of Submittals.

E. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

F. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

G. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
   a. Date issued.
   b. Project title and number.
   c. Name of inspector.
   d. Date and time of sampling or inspection.
   e. Identification of product and specifications section.
   f. Location in the Project.
   g. Type of test/inspection.
   h. Date of test/inspection.
   i. Results of test/inspection.
   j. Compliance with Contract Documents.
   k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

H. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

I. 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.

J. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

K. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory: Authorized to operate in the State in which the Project is located.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

D. Refer to Section 01 0150 - "Special Conditions" for additional information and requirements.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 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.

3.02 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. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

F. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

G. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   6. Build mock-up in the following 3 phases (minimum). Obtain approval of each phase from Architect before proceeding.
      a. Substrate construction, and waterproofing.
      b. Opening installation, and flashing.
      c. Veneer. (Divide this into multiple phases of mock-up if there are multiple layers.)
   7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   8. Protect mock-ups from the elements with weather-resistant membrane.
   9. Demolish and remove mockups when directed unless otherwise indicated.

I. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

J. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. See Drawings for any required Room Mockups.

3.03 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.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.

6. Perform additional tests and inspections required by Architect.
7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
a. To provide access to Work to be tested/inspected.
b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Price.

F. Refer to Section 01 0150 - "Special Conditions" for additional information and requirements.

3.05 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 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.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

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SECTION 01 4100

STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.

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. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. 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.
   3. Requirements for contractor to provide quality-assurance and -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.

D. Related Sections include but are not limited to the following:
   1. Section 02 2000 - “Earthwork”
   2. Section 03 3100 - “Cast-In-Place Concrete”
   3. Section 04 2200 – “Concrete Masonry Unit”
   4. Section 05 1200 - “Structural Steel”
   5. Section 05 2100 - “Steel Joists”
   6. Section 05 3100 - “Steel Deck”
   7. Section 05 3200 - "Acoustical Steel Deck”
   8. Section 05 4000 – “Cold-Formed Metal Framing”

1.03 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.

B. Construction Documents: Written, 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.

E. 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.

F. 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.

G. 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.

H. 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.

1.04 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. 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.

B. Qualifications of Special Inspector: The Special Inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the Building Official, for inspection of the particular type of construction or operation being inspected. The Special Inspector shall meet the legal qualifications of the building code having jurisdiction.

1. Duties and Responsibilities of the Special Inspector:
   a. The Special Inspector shall observe the work assigned to ascertain, to the best of his/her knowledge that it is in conformance with the approved design drawings and specifications.
   b. The Special Inspector shall furnish inspection reports to the Building Official, the Architect/Engineer, and the Owner. All discrepancies shall be brought to the immediate attention of the Architect/Engineer, Contractor, and Owner. A report that the corrected work has been inspected shall be sent to the Building Official, the Architect/Engineer, and the Owner.
   c. The Special Inspector shall create and maintain a log of all discrepancies throughout the duration of the project. This log shall include, but is not limited to, discrepancy date, description, drawing and/or detail reference, description of as-built condition, description of any remedial work performed, and status of discrepancy. This log shall be submitted to the Architect/Engineer on a periodic basis for the review and comment. Upon completion of the project, this log shall be submitted in its entirety as an attachment to the final signed report described below.
   d. The Special Inspector shall submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance to the approved plans and specifications and the applicable workmanship provisions of the building code.

1.05 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.

1.06 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.

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. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

1.07 PAYMENT OF TESTING LABORATORY

A. The Owner will pay for the initial laboratory services for the testing of materials for compliance with the requirements of the contract documents. The Contractor will be liable to the Owner for the cost for testing and retesting of materials that do not comply with the requirements of the contract documents and shall furnish and pay for the testing and inspection of other items as specified in these Specifications.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.01 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.
   1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
   2. 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.
   3. 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:
   1. 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.
   2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
   3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.02 STRUCTURAL OBSERVATIONS

A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.03 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.

B. 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.

3.04 SCHEDULES AND FORMS – ATTACHED OR IN CONSTRUCTION DOCUMENTS

A. STATEMENT OF SPECIAL INSPECTIONS

B. SCHEDULE OF SPECIAL INSPECTIONS (ON STRUCTURAL DRAWINGS)

C. FINAL REPORT OF SPECIAL INSPECTIONS

END OF STRUCTURAL TESTS AND SPECIAL INSPECTIONS

STATEMENT OF SPECIAL INSPECTIONS

Project:
Project Address:
Permit Applicant:
Applicant Address:
Owner:
Owner Address:
Registered Design Professionals (RDP):
Architect:
Geotechnical Engineer:
Structural Engineer:
Mechanical Engineer:
Electrical Engineer:

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. 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 the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than_____.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Acknowledgement:

_____
Signature Date

Building Official's Acceptance:

_____
Signature Date

_____
Permit No.

FINAL REPORT OF SPECIAL INSPECTIONS

Project:
Project Address:
Testing / Inspection Agent:
Testing / Inspection Agent Address:
Scope of Testing / Inspections:

(To be completed by Testing / Inspection Agent)

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 *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.
Interim reports submitted prior to this final report and numbered _____ to _____ form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated
have been corrected:

Prepared By:

Type or print name

Signature Date

Special Inspector's Seal

(Licensed Professional Engineer)

SECTION 01 4223
REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 DEFINITIONS:

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Architect," "requested by the Architect," and similar phrases.

D. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, temporary storage, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer:
   1. An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
   2. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

J. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

K. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land on which the Project is to be built.
   1. If areas available are not indicated, they will be as mutually agreed by Owner and Contractor at Preconstruction Conference and as modified during construction.

L. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

M. OFCI - Owner Furnished, Contractor Installed.

N. OFOI: Owner Furnished, Owner Installed.
   1. Equipment indicated on the drawings with the (OFOI) symbol designates the Owner will supply and deliver to the project site any equipment and finish items specified in these specifications and the Owner install the equipment and finish items in place ready for intended use.
   2. The Owner shall furnish all standard integral parts of the equipment and finishes, and tailgate-deliver items to project site.
   3. Owner shall receive items at site and give written receipt for items at time of delivery, noting visible defects or omissions. If such declaration is not given, the Owner shall assume responsibility for such defects and omissions. Contractor shall be responsible for cooperating with the Owner who shall provide unloading, handling and proper storage of equipment prior to installation at the site. The Owner and the Contractor will coordinate deliveries of equipment and finish items to coincide with construction schedule to minimize storage of equipment before installation.
   4. Owner shall uncrate, assemble, set items in place, and install items in accordance with manufacturer's instructions.
   5. Contractor shall provide utility rough-in for equipment items where required regardless of equipment responsibility designation unless specifically noted otherwise.
   6. Contractor shall be responsible for verification of utility requirements for approved equipment items. Upon request, the Owner shall make available dimensions and power characteristics of the Owner-furnished items.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 50-Division format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
   1. Abbreviated Language:
      a. Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.
   2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1.04 INDUSTRY STANDARDS:

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements:
   1. Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
   2. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards:
   1. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
   2. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

1.05 DRAWING SYMBOLS:

A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., seventh edition.

B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.06 SUBMITTALS:

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 4533
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. Code or Building Code: ICC (IBC), International Building Code, Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements and specifically, Chapter 17 - Special Inspections and Tests.

B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

C. Special Inspection:
   1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
   2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.04 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2022.

C. AISC 360 - Specification for Structural Steel Buildings; 2022.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

E. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2024.

F. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

G. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

H. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

I. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

J. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).

K. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

M. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

N. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).

O. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 SUBMITTALS

A. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
   1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Submit certification that Special Inspection Agency is acceptable to AHJ.

B. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures. Include documentation of AHJ approval.

C. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.
      d. Date and time of special inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of special inspection.
      h. Date of special inspection.
      i. Results of special inspection.
      j. Compliance with Contract Documents.
   2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

D. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test or inspection.
      h. Date of test or inspection.
      i. Results of test or inspection.
      j. Compliance with Contract Documents.

1.06 SPECIAL INSPECTION AGENCY

A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.

B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.

C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.07 TESTING AND INSPECTION AGENCIES

A. Owner or Architect may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION

A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC)-2018.

B. High-Strength Bolt, Nut and Washer Material:
   1. Verify identification markings comply with ASTM standards specified in the approved contract and to AISC 360, Section A3.3; periodic.
   2. Submit manufacturer's certificates of compliance; periodic.

C. Structural Steel and Cold Formed Steel Deck Material:
   1. Structural Steel: Verify identification markings comply with AISC 360, Section M3.5; periodic.
   2. Other Steel: Verify identification markings comply with ASTM standards specified in the approved Contract Documents; periodic.
   3. Submit manufacturer's certificates of compliance and test reports; periodic.

D. Weld Filler Material:
   1. Verify identification markings comply with AWS standards specified in the approved Contract Documents and to AISC 360, Section A3.5; periodic.
   2. Submit manufacturer's certificates of compliance; periodic.

E. Welding:
   1. Structural Steel and Cold Formed Steel Deck:
      a. Complete and Partial Joint Penetration Groove Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
      b. Multipass Fillet Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
      c. Single Pass Fillet Welds Less than 5/16 inch Wide: Verify compliance with AWS D1.1/D1.1M; periodic.
      d. Plug and Slot Welds: Verify compliance with AWS D1.1/D1.1M; continuous.
      e. Single Pass Fillet Welds 5/16 inch or Greater: Verify compliance with AWS D1.1/D1.1M; continuous.
      f. Floor and Roof Deck Welds: Verify compliance with AWS D1.3/D1.3M; continuous.
   2. Reinforcing Steel: Verify items listed below comply with AWS D1.4/D1.4M and ACI CODE-318, Section 3.5.2.
      a. Verification of weldability; periodic.
      b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames as well as where it is referenced in older codes. Elements of special structural walls of concrete and shear reinforcement; continuous.
      c. Shear reinforcement; continuous.
      d. Other reinforcing steel; periodic.

F. Steel Frame Joint Details: Verify compliance with approved Contract Documents.
   1. Details, bracing and stiffening; periodic.
   2. Member locations; periodic.
   3. Application of joint details at each connection; periodic.

G. Cold-formed steel trusses spanning 60 feet or more; periodic.

3.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

A. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M, and ACI CODE-318, Sections 5.6 and 5.8 and record the following, continuous:
   1. Slump.
   2. Air content.
   3. Temperature of concrete.

3.04 SPECIAL INSPECTIONS FOR MASONRY CONSTRUCTION

A. Masonry Structures Subject to Special Inspection:
   1. Empirically designed masonry, glass unit masonry and masonry veneer in structures designated as "essential facilities".
   2. Engineered masonry in structures classified as "low hazard..." and "substantial hazard to human life in the event of failure".

B. Verify each item below complies with approved Contract Documents and the applicable articles of TMS 402/602.
   1. Inspections and Approvals:
      a. Verify compliance with the required inspection provisions of the approved Contract Documents; periodic.
      b. Verify approval of submittals required by Contract Documents; periodic.
   2. Compressive Strength of Masonry: Verify compressive strength of masonry units prior to start of construction unless specifically exempted by code; periodic.
   3. Slump Flow and Visual Stability Index (VSI): Verify compliance as self consolidating grout arrives on site; continuous.
   4. Joints and Accessories: When masonry construction begins, verify:
      a. Proportions of site prepared mortar; periodic.
      b. Construction of mortar joints; periodic.
      c. Location of reinforcement, connectors, prestressing tendons, anchorages, etc; periodic.
   5. Structural Elements, Joints, Anchors, Protection: During masonry construction, verify:
      a. Size and location of structural elements; periodic.
      b. Type, size and location of anchors, including anchorage of masonry to structural members, frames or other construction; periodic.
      c. Size, grade and type of reinforcement, anchor bolts and prestressing tendons and anchorages; periodic.
      d. Welding of reinforcing bars; continuous.
   6. Grouting Preparation: Prior to grouting, verify:
      a. Grout space is clean; periodic.
      b. Correct placement of reinforcing, connectors, prestressing tendons and anchorages; periodic.
      c. Correctly proportioned site prepared grouts and prestressing grout for bonded tendons; periodic.
      d. Correctly constructed mortar joints; periodic.
   7. Preparation of Grout Specimens, Mortar Specimens and Prisms: Observe preparation of specimens; periodic.

C. Engineered Masonry in Buildings Designated as "Essential Facilities": Verify compliance of each item below with approved Contract Documents and the applicable articles of TMS 402/602.
   1. Inspections and Approvals:
      a. Verify compliance with the required inspection provisions of the approved Contract Documents; periodic.
      b. Verify approval of submittals required by Contract Documents; periodic.
   2. Compressive Strength of Masonry: Verify compressive strength of masonry units prior to start of construction and upon completion of each 5,000 square feet increment of masonry erected during

construction; periodic.

3. Preblended Mortar and Grout: Verify proportions of materials upon delivery to site; periodic.
4. Slump Flow and Visual Stability Index (VSI): Verify compliance as self consolidating grout arrives on site; continuous.
5. Engineered Elements, Joints, Anchors, Grouting, Protection: Verify compliance of each item below with approved Contract Documents and referenced standards.
   a. Proportions of site prepared mortar; periodic.
   b. Placement of masonry units and construction of mortar joints; periodic.
   c. Placement of reinforcement, connectors, prestressing tendons, anchorages, etc.; periodic.
   d. Size and location of structural elements; periodic.
   e. Type, size and location of anchors, including anchorage of masonry to structural members, frames or other construction; continuous.
   f. Size, grade and type of reinforcement, anchor bolts and prestressing tendons and anchorages; periodic.
   g. Welding of reinforcing bars; continuous.
6. Preparation of Grout Specimens, Mortar Specimens and Prisms: Observe preparation of specimens; continuous.

3.05 SPECIAL INSPECTIONS FOR PREFABRICATED AND SITE-BUILT WOOD CONSTRUCTION

A. High Load Diaphragms: Verify compliance of each item below with approved Contract Documents.
   1. Grade and thickness of sheathing.
   2. Nominal size of framing members at adjacent panel edges.
   3. Nail or staple diameter and length.
   4. Number of fastener lines.
   5. Fastener spacing at lines and at edges.

B. Metal Plate Connected Wood Trusses with Clear Span of 60 feet or More: Verify compliance of each item below with approved Contract Documents in general and with approved truss submittal package in particular.
   1. Temporary restraint and bracing.
   2. Permanent individual truss member restraint and bracing.

3.06 SPECIAL INSPECTIONS FOR SOILS

A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
   1. Design bearing capacity of material below shallow foundations; periodic.
   2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
   3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
   4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.

B. Testing: Classify and test excavated material; periodic.

3.07 SPECIAL INSPECTIONS FOR DRIVEN DEEP FOUNDATIONS

A. Materials, Equipment and Final Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
   1. Material types, sizes and lengths; continuous.
   2. Capacities of test elements and additional load tests as required; continuous.
   3. Placement locations and plumbness; continuous.
   4. Type and size of hammer; continuous.

B. Installation: Observe driving operations and maintain complete and accurate records for each element; continuous.
   1. Record number of blows per foot of penetration.
   2. Determine penetration required to achieve design capacity.
   3. Record tip and butt elevations.
   4. Document any damage to foundation element.

C. Steel Components of Driven Deep Foundations: Perform additional inspections as required by the Special Inspections for Steel Construction article of this section.

D. Concrete and Concrete Filled Components of Driven Deep Foundations: Perform additional inspections as required by the Special Inspections for Concrete Construction article of this section.

3.08 SPECIAL INSPECTIONS FOR CAST-IN-PLACE DEEP FOUNDATIONS

A. Materials, Equipment and Final Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
1. Element length; continuous.
2. Element diameters and bell diameters; continuous.
3. Embedment into bedrock; continuous.
4. End bearing strata capacity; continuous.
5. Placement locations and plumbness; continuous.
6. Type and size of hammer; continuous.

B. Drilling Operations: Observe and maintain complete and accurate records for each element; continuous.

C. Material Volume: Record concrete and grout volumes.

D. Concrete Elements Associated with Cast-in-Place Deep Foundations: Perform additional inspections as required by the Special Inspections for Concrete Construction article of this section.

3.09 SPECIAL INSPECTIONS FOR HELICAL PILE FOUNDATIONS

A. Materials, Equipment and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
1. Type and capacity of installation equipment used; continuous.
2. Pile dimensions; continuous.
3. Tip elevation; continuous.
4. Final depth; continuous.
5. Final installation torque; continuous.
6. Other installation data requested in writing by Architect; continuous.

3.10 SPECIAL INSPECTIONS FOR VERTICAL MASONRY FOUNDATION ELEMENTS

A. Vertical Masonry Foundation Elements are subject to the same special inspection requirements listed in the "Special Inspections for Masonry Construction" Article of this section.

3.11 SPECIAL INSPECTIONS FOR SPRAYED FIRE RESISTANT MATERIALS

A. Sprayed Fire Resistant Materials, General:
1. Verify compliance of sprayed-fire resistant materials with specific fire-rated assemblies indicated in approved Contract Documents, and with applicable requirements of the building code.
2. Perform special inspections after rough installation of electrical, mechanical, plumbing, automatic fire sprinkler and suspension systems for ceilings.

B. Physical and visual tests: Verify compliance with fire resistance rating.
1. Condition of substrates; periodic.
2. Thickness of sprayed fire resistant material; periodic.
3. Density of sprayed fire resistant material in pounds per cubic foot; periodic.
4. Bond strength (adhesion and cohesion); periodic.
5. Condition of finished application; periodic.

C. Structural member surface conditions:
1. Inspect structural member surfaces before application of sprayed fire resistant materials; periodic.
2. Verify preparation of structural member surfaces complies with approved Contract Documents and manufacturer's written instructions; periodic.

D. Application:

1. Ensure minimum ambient temperature before and after application complies with the manufacturer's written instructions; periodic.
2. Verify area where sprayed fire resistant material is applied is ventilated as required by the manufacturer's written instructions during and after application; periodic.

E. Thickness: Verify that no more than 10 percent of thickness measurements taken from sprayed fire resistant material are less than thickness required by fire resistance design in approved Contract Documents. In no case shall the thickness of the sprayed fire resistant material be less than the minimum below.
1. Minimum Allowable Thickness: Tested according to ASTM E605/E605M, periodic.
a. Design thickness 1 inch or greater: Design thickness minus 1/4 inch.
b. Design thickness greater than 1 inch: Design thickness minus 25 percent.

F. Density: Verify density of sprayed fire resistant material is no less than density required by the fire resistance design in the approved Contract Documents.

G. Bond Strength: Verify adhesive and cohesive bond strength of sprayed fire resistant materials is no less than 150 pounds per square foot when in-place samples of the cured material are tested according to ASTM E736/E736M and as described below.

3.12 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

A. Structural Steel: Comply with the quality assurance plan requirements of AISC 341.

B. Structural Wood:
1. Field gluing; continuous.
2. Nailing, bolting, anchoring and other fastening of components within the seismic force-resisting system; periodic.

C. Cold Formed Steel Light Frame Construction:
1. Field welding; periodic.
2. Screw attachment, bolting, anchoring and other fastening of components within the main seismic force-resisting system; periodic.

D. Designated Seismic System Verification: Verify label, anchorage or mounting complies with certificate of compliance provided by manufacturer or fabricator.

E. Structural Testing for Seismic Resistance:
1. Concrete reinforcement: Comply with ACI CODE-318, Section 21.1.5.2.
a. Materials Obtain mill certificates demonstrating compliance with ASTM A615/A615M; periodic.
b. Welding: Perform chemical tests complying with ACI CODE-318, Section 3.5.2 to determine weldability; periodic.
2. Structural Steel: Comply with the quality assurance requirements of AISC 341.

F. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

3.13 SPECIAL INSPECTIONS FOR WIND RESISTANCE

3.14 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified reference standards.
3. Ascertain compliance of materials and products with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests or inspections specified.

B. Limits on Special Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.

3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.15 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests or inspections specified.

B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.16 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to work to be tested or inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
   c. To facilitate tests or inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

B. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

C. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

END OF SECTION

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. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 5813 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Existing facilities may not be used.

1.04 TELECOMMUNICATIONS SERVICES

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

B. Telecommunications services shall include:
   1. Telephone Lines: One line, minimum; one handset per line.
   2. Internet Connections: Minimum of one; DSL modem or faster.
   3. Cellular phones are an acceptable substitute for items 1 & 2, provided they fulfill requirements of same.

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. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

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

1.07 FENCING

A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Provide gates as required by Contractor and/or authorities having jurisdiction, with all related safety and warning signs.
   1. Fencing shall be at least 11-1/2 gauge galvanized chain-link fencing, securely held in place by posts, braces, rails, etc.

B. Fence shall be approximately 30-feet from perimeter of buildings, unless Drawings indicate otherwise. Extent of fencing shall be as required to maintain a secure worksite.

C. All such fencing shall be removed upon completion of the work of this project, removed from the site, and any post holes filled and compacted same as adjacent grade or paving, by the Contractor.

D. Responsibility and maintenance of such fencing and areas within such fencing shall be held by this Contractor beginning at the date of its erection and until its removal, close to the date of project completion.

1.08 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

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

C. Provide and maintain access to fire hydrants, free of obstructions.

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

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT SIGNS - SEE SECTION 01 5813

1.13 FIELD OFFICES

A. Office: Weathertight, with lighting, restrooms, 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 10 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 5813
TEMPORARY PROJECT SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 RELATED REQUIREMENTS

A. Section 01 0150 - Special Conditions: Supplemental sign information.

B. Project Sign Detail: Included at the end of this Section.

1.03 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

1.04 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 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.
   1. See Project Sign Detail for Options.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

E. Lettering: Exterior quality paint, colors as selected.
   1. See Project Sign Detail for Options.

2.02 PROJECT IDENTIFICATION SIGN

A. Painted sign of construction, design, and content shown on Project Sign Detail, and described below.
   1. Refer to Detail of Project Sign, following this Section.

B. Content:
   1. Project number, title, logo and name of Owner as indicated on Contract Documents.
   2. Names and titles of authorities.
   3. Names and titles of Architect.
   4. Name of Prime Contractorand major Subcontractors.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.03 PROJECT INFORMATIONAL SIGNS

A. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

B. Provide at each field office, storage shed , and directional signs to direct traffic into and within site. Relocate as Work progress requires.

C. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at location of high public visibility adjacent to main entrance to site.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

E. Paint exposed surfaces of sign, supports, and framing.

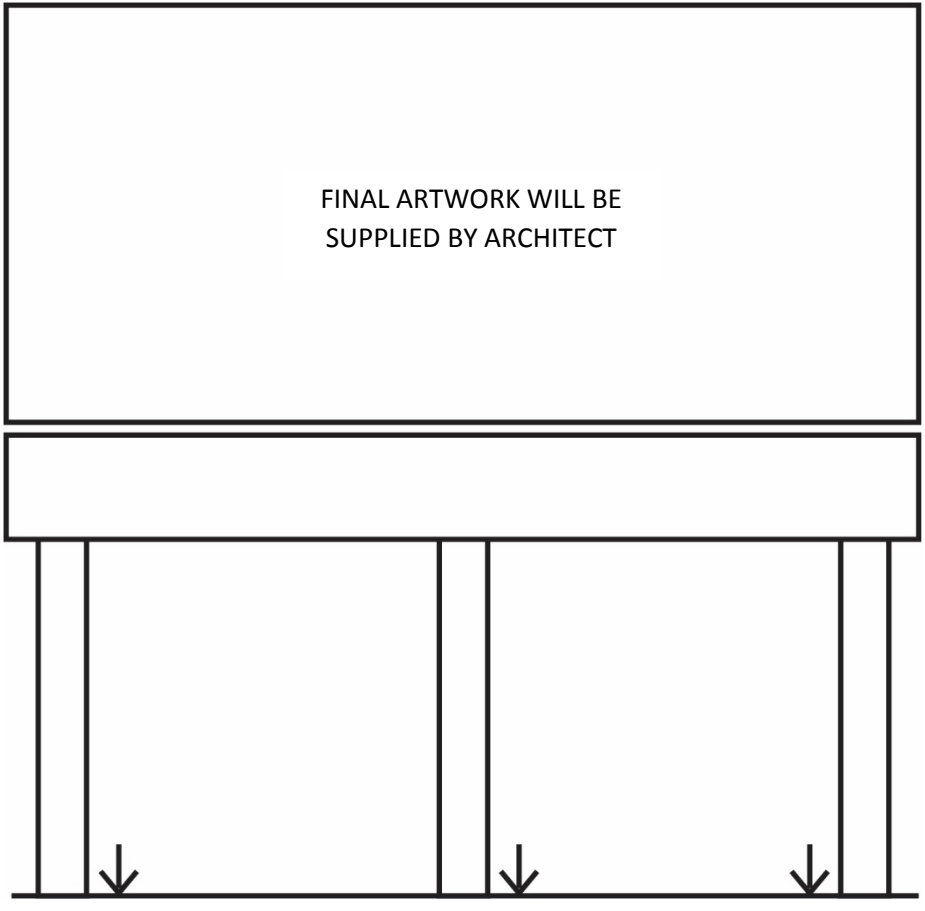
3.02 MAINTENANCE

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.

END OF SECTION



SIGN: 8’ X 4’ SIGN WITH 8’ X 1’ADDITION PRINTED ON ½” THICK COROPLAST OR CORRUGATED ALUMINUM, PRINTED ON FLAT-BED ARIZONA PRINTER OR EQUIVALENT WITH UV INKS IN FULL COLOR. CONTACT ARCHITECT FOR FINAL ARTWORK.

OPTION: PRINT ON EXTERIOR GRADE VINYL WITH UV INKS IN FULL COLOR APPLIED TO 8’ X 4’ X ½” THICK COROPLAST OR CORRUGATED ALUMINUM. CONTACT ARCHITECT FOR FINAL ARTWORK.

WOOD POSTS: P.T. 4 X 4 X FULL HEIGHT OF SIGN, WITH 45˚ TO 60˚ SLOPED P.T. 4 X 4 WOOD BACK BRACES FROM TOP OF SIGN, BRACE BETWEEN POSTS AT TOP & BOTTOM W/FLAT P.T. 2 X 6 OR 4 X 4. SET POSTS 3’- O” MINIMUM INTO GROUND, IN 12” DIAMETER X 3’ - 6” DEEP CONCRETE FOOTINGS.

TOP OF SIGN: 7 FT. TO 8 FT. ABOVE FINISHED GRADE.

SECTION 01 6000
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. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Instructions To Bidders, and Supplementary Instructions To Bidders: Additional information and requirements concerning Substitutions.

B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 - PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made of wood from newly cut old growth timber.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.
   3. Result in less construction waste. See Section 01 7419
   4. Are made of vegetable materials that are rapidly renewable.

2.02 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

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.

B. Acceptance of suppliers, manufacturers, and/or products shall be limited to those named, unless others are properly submitted during bidding in accordance with substitution procedures, and subsequently accepted.

C. Instructions to Bidders specifies time restrictions and procedures for submitting requests for substitutions during the bidding period. These time restrictions and procedures are superceded by any modifications found in Supplementary Instructions to Bidders (or Additions to Instructions to Bidders).

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
   1. Submittals during construction other than those pre-qualified or pre-accepted will not be reviewed, but instead returned for re-submittal, without exception.

E. Substitution Submittal Procedure. A proper pre-bid submittal for "pre-qualified" or "pre-accepted" consideration and review, shall be one which includes at least the following:
   1. Submit request for substitution for consideration. Limit each request to one proposed substitution.
      a. Use Substitution Request form attached at end of this Section.
   2. Submit with cover letter which outlines the purpose of the submittal, Architect's specifications which apply, and each variation from the original specification.
   3. Submit product data (all current and relevant manufacturer's published data), certified test results attesting to the proposed product equivalence, and additional information as required so that a review can be quickly made by comparing the submittal item for item to the original specification. Include samples and other data as requested for the original item. Burden of proof is on proposer.
   4. Substitution requests shall be submitted through a qualified General Contractor bidding the project.

F. After receipt of bids and execution of the Construction Contract, the Owner and the Architect will consider substitutions only under the following conditions:
   1. Unavailability of materials if beyond the control of the Contractor and submitted proof that firm orders for the material were placed within ten (10) days after approval of the Subcontractors and Material Suppliers Lists.
   2. Other unavailability will be considered only as being due to strikes, lockouts, bankruptcy, or discontinuance of manufacture.
   3. Any approved substitutions shall be incorporated into the Contract by Change Order.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.

4. Repair or replace items damaged after receipt.

3.03 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.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

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SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

Attn: _____ A/E Project No.: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page and Paragraph: _____

Proposed Substitution: _____

Trade Name: _____

Manufacturer: _____ Model No.: _____

Mfg. Address _____ City, State, zip: _____ Phone: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the date are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

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 the substitution.

Submitted by: _____

Signed 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 ☐ _____

INCOMPLETE INFORMATION WILL BE GROUNDS FOR REJECTION

SECTION 01 7000
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. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

G. General requirements for maintenance service.

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 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

D. Section 02 4100 - Demolition: Selective demolition of building elements for alterations purposes.

E. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Alternatives to cutting and patching.
      f. Effect on work of Owner or separate Contractor.
      g. Written permission of affected separate Contractor.
      h. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For survey work, employ a Professional Land Surveyor licensed in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 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.
   1. Contractor shall schedule ordering of products, taking lead-times into account, and shall be responsible for any cost associated with expediting delivery of specified items in order to keep project on schedule.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner-occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 - PRODUCTS

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.
   1. Every trade shall examine substrate to determine if it is adequate to receive the work of that section prior to initiating work.
   2. Notify Contractor of any deficiencies needing correction.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

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. Contractor shall locate and protect survey control and reference points.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize Standards of Practice for Professional Land Surveyors.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

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 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

J. Patching:
1. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
2. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
3. Match color, texture, and appearance.
4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

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

3.10 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See appropriate Division 23 Section.

3.11 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect.

B. The Contractor shall generate and provide a punch-list to the Architect prior to requesting inspection for substantial completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Accompany Architect on Contractor's preliminary final inspection.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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SECTION 01 7419
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 Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures.

B. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 01 6000 - Product Requirements: Waste prevention requirements related to product substitutions.

E. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

F. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

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 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 and Section 01 2500.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
   1. Relative amount of waste produced, compared to specified product.

2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
3. Proposed disposal method for waste product.
4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 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.

3.02 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. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.
   4. Job safety meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. As a minimum, provide:
      a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
      b. Separate dumpsters for each category of recyclable.
      c. Recycling bins at worker lunch area.
   2. Provide containers as required.
   3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
   4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   5. Locate enclosures out of the way of construction traffic.
   6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
   8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

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SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. All record documents, warranties and O&M manuals are to be submitted in paper format (1 copy) along with 3 copies of USB Drives of PDF's of the documents.

B. At completion of Project, the Contractor shall submit to Architect a complete set of clearly marked-up Project Documents, as follows:
   1. One (1) Original Set clearly marked as-built, record drawings and specifications.
   2. Three (3) copies of USB Drives: Each with as-built record drawings and as-built record specifications along with O&M Manuals and Warranties.

C. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit one paper set and three USB Drives of revised final documents in final form within 10 days after final inspection, each with as-built record drawings and as-built record specifications along with O&M Manuals and Warranties as referenced above.

D. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.
   4. Submit CD's with PDF's of as-built record drawings and as-built record specifications along with O&M Manuals and Warranties as referenced above.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 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. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

G. Scan marked-up Record Drawings and Specifications onto three (3) USB Drives (each with as-built record drawings and as-built record specifications).

3.02 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.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

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

3.05 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. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

D. Prepare data in the form of an instructional manual.

E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.

N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit to Commissioning Authority for review and inclusion in overall training plan.
   3. Submit not less than four weeks prior to start of training.
   4. Revise and resubmit until acceptable.
   5. Provide an overall schedule showing all training sessions.
   6. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
   4. Include Commissioning Authority's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: Owner's preference.
   2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

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05.28.2024

FOR SPECIFICATION SECTIONS
01 4100, 03 3000, 05 1200, 05 2100, 05 3100 AND 05 3200

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Formwork
   2. Reinforcing.
   3. Cast-in-place concrete including mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes the following:
   1. Pile caps, grade beams, foundations, and footings.
   2. Slabs-on-grade.
   3. Foundation walls.
   4. Shear walls.
   5. Building frame members.
   6. Equipment pads and bases.
   7. Stairs.

C. Related Documents: Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

D. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 02 20 00, “Earthwork”: Drainage fill under slabs on grade
   2. Section 02 51 40, “Portland Cement Concrete Paving”: Concrete paving and walks.
   3. Section 03 33 00, “Architectural Cast-in-Place Concrete.”
   4. Section 05 31 00, “Steel Decking”: Steel Decking to receive concrete fill.
   5. Section 05 50 00, “Metal Fabrications”: Metal items to be built into concrete.
   6. Section 07 90 00, “Sealants and Joint Fillers”: Sealants and joint fillers in concrete work.
   7. Respective Sections of Division 15 and 16, as applicable, for furnishing of inserts, anchorage and erection items required for mechanical and electrical work.
   8. Divisions 15 and 16 as applicable, for furnishing and setting of conduit, pipes and sleeves for mechanical and electrical equipment.

1.02 SUBMITTALS:

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
   1. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
   2. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures” showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement

of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

3. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually. Formwork drawings shall bear the seal and signature of a Professional Engineer registered in the State of Alabama.
4. Coordination drawings for all installed embeds, anchor bolts, embedded piping, etc.
5. Architect's review is for general architectural applications and features only. Designing formwork for structural stability and efficiency is Contractor's responsibility.
6. Samples of materials as requested by Architect, including names, sources, and descriptions, as follows:
    a. Color finishes.
    b. Normal weight aggregates.
    c. Reglets.
    d. Waterstops.
    e. Vapor retarder/barrier.
7. Laboratory test reports for concrete materials and mix design test.
8. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
9. Minutes of preinstallation conference.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
    1. ACI 301, "Specifications for Structural Concrete for Buildings".
    2. ACI 302, "Guide for Concrete Floor and Slab Construction".
    3. ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
    4. ACI 305, "Hot Weather Concreting".
    5. ACI 306, "Cold Weather Concreting".
    6. ACI 309, "Guide for Consolidation of Concrete".
    7. ACI 311, "Recommended Practice for Concrete Inspection".
    8. ACI 318, "Building Code Requirements for Reinforced Concrete".
    9. ACI 347, "Recommended Practice for Concrete Formwork".
    10. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
    11. American Welding Society, AWS D1.4 "Structural Welding Code – Reinforcing Steel".
B. Concrete Testing Service: Engage a testing agency acceptable to Architect to perform material evaluation test and to design concrete mixes.
    1. Refer to Division 1 Section "Special Conditions" for additional information and requirements.

C. 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 Owner's expense.

D. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meeting" and the following:

1. At least 35 days prior to submitting design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certification. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:

a. Contractor's superintendent.

b. Agency responsible for concrete design mixes.

c. Agency responsible for field quality control.

d. Ready-mix concrete producer.

e. Concrete subcontractor.

f. Primary admixture manufacturers.

PART 2 PRODUCTS

2.01 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Care shall be taken with the formwork on the bottom of the slabs, which will be exposed ceilings, to avoid the need for patching or repairs following the removal of the formwork. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.

2. Use plywood complying with U.S Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled, and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for a tight fit.

C. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflections and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

E. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use concrete bricks or supports with sand plates or horizontal runners where base materials will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (RSI, Class 2).

E. Bar and Rod Mats: ASTM A 184 "Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement".

F. Threaded Dowels: Continuous threaded high-strength steel bars equal to "Lasstud" by Richmond Screw Anchor Co., Inc. Provide inserts compatible with dowels, designed for ultimate pull-out force indicated on the drawings.

G. Mechanical Splices: Equal to "Cadweld Rebar Splices", as manufactured by Erico Products, Inc., "C" Series, for developing 125% of minimum ASTM specified yield strengths, unless otherwise noted on drawings.

H. Steel Shapes, Plates and Rods: Conform to ASTM A 36, "Specification for Structural Steel".

I. Do Not Weld Reinforcing Steel: Unless specifically noted on drawings. If welding is shown, conform to latest revisions of AWS D12.1, "Reinforcing Steel Welding Code of the American Welding Society". Perform all welding with certified welders qualified per AWS.

2.03 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type I or IL.

1. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type F.

1. Limit use of fly ash to not exceed 20 percent of cement content by weight.

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

D. Water: Potable.

E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Air-Tite, Cormix Construction Chemicals.
   b. Air-Mix or Perma-Air, Euclid Chemical Co.
   c. Darex AEA or Daravair, W. R. Grace & Co.
   d. MB-VR or Micro-Air, Master Builders, Inc.
   e. Sealtight AEA, W.R. Meadows, Inc.

f. Sika AER, Sika Corp.

G. Water-Reducing Admixture: ASTM C 494, Type A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. PSI N, Cormix Construction Chemicals.

b. Eucon WR-75, Euclid Chemical Co.

c. WRDA, W.R. Grace & Co.

d. Pozzolith Normal or Polyheed, Master Builders, Inc.

e. Platocrete 161, Sika Corp.

H. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Eucon 37, Euclid Chemical Co.

b. WRDA 19 or Daracem, W.R. Grace & Co.

c. Rheobuild or Polyheed, Master Builders, Inc.

d. Sikament 300, Sika Corp.

I. Water-Reducing, Accelerating Admixture: ASTM CF 494, Type E.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Accelguard 80, Euclid Chemical Co.

b. Daraset, W.R. Grace & Co.

c. Pozzutec 20, Master Builders, Inc.

J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Eucon Retarder 75, Euclid Chemical Co.

b. Daratard-17, W.R. Grace & Co.

c. Pozzolith R, Master Builders, Inc.

d. Protard, Prokrete Industries.

e. Plastiment, Sika Corp.

2.04 RELATED MATERIALS:

A. Reglets: Where sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217-inch-thick (26-gage) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick (22 gage) with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.

C. Waterstops: Provide strip applied, flat, dumbbell-type or centerbulb-type waterstops at construction joints and other joints as indicated. Size to suit joints.

1. Flexible Butyl Rubber Strip Applied Waterstops:

a. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Swellstop, as manufactured by Greenstreak.
2. Synkoflex.

2. Rubber Waterstops: Corps of Engineers CRD-C 513.

a. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. The Burke Co.
2. Progress Unlimited.
3. Williams Products, Inc.

3. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.

a. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. The Burke Co.
2. Greenstreak Plastic Products Co.
3. W.R. Meadows, Inc.
4. Progress Unlimited.
5. Schlegel Corp.
6. Vinylex Corp.

D. Vapor Barrier:

1. Vapor Barrier, General Use (except as indicated below): At least 10-mil thick polyethylene-coated barrier paper, or 1/8" thick asphalt core membrane sheet.

a. Product/Manufacturer: Equivalent to "Moistop Underslab", as manufactured by Fortifiber Building Products Systems; Reno, NV. Including in part, joint mastic and/or seals, and all other components required for a complete, proper, and vaporproof installation.

b. Locations for Use: Continuous below all building slabs, and other structural slabs, porches, stoops, pads, covered (below roofs) areas, etc., on grade, and turned down to tops of footings.

E. Coordinate the use (or non-use) of membrane-forming compounds with the suppliers of finishes to be provided on concrete surfaces. Do not use membrane-forming compounds at locations where they may have detrimental effect on the permanent installation of the finish materials, floor coverings, their adhesives, setting beds, etc. At such locations, utilize only dissipating type compounds.

F. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Spartan-Cote, The Burke Co.
b. Day-Chem Cure and Seal, Dayton Superior Corp.
c. Eurocure, Euclid Chemeical Co.
d. Horn Clear Seal, A.C. Horn, Inc.
e. L&M Cure R, L&M Construction Chemicals, Inc.
f. Masterkure, Master Builders, Inc.
g. CS-309, W.R. Meadows, Inc.

h. Kure-N-Seal, Sonneborn-Chemrex.

G. V.O.C. Compliant Acrylic Curing and Sealing Type (30 Percent): Liquid type membrane-forming curing compound complying with ASTM C 309, Type 1, class A and B. Provide 30 percent solids minimum, for surfaces indicated to be sealed.

H. Safe Cure and Seal: 30 percent (J-19), Dayton Superior Inc.

I. Evaporation Control:

1. Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1. Eucobar, Euclid Chemical Co.
      2. E-Con, L&M Construction Chemicals, Inc.
      3. Confilm, Master Builders, Inc.

J. V.O.C. Compliant Evaporation Control: Sure Film (J-74), Dayton Superior Inc.

K. Underlayment Compound: Free-Flowing, self-leveling, pumpable, cement-based compound for applications from 1 inch thick to feathered edges.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. K-15, Ardex, Inc.
   b. LevelLayer II, Dayton Superior Corp.
   c. Flo-Top, Euclid Chemical Co.
   d. Gyp-Crete, Gyp-Crete Corp.
   e. Levelex, L&M Construction Chemicals, Inc.
   f. Underlayment 110, Master Builders, Inc.
   g. Thoro Underlayment Self-Leveling, Thoro System Products.

L. Bonding Agent: polyvinyl acetate or acrylic base.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Polyvinyl Acetate (Interior Only):
      1. Superior Concrete Bonder, Dayton Superior Corp.
      2. Euco Weld, Euclid Chemical Co.
      3. Weld-Crete, Larsen Products Corp.
      4. Everweld, L&M Construction Chemicals, Inc.
      5. Ready Bond, Symons Corp.
   b. Acrylic or Styrene Butadiene:
      1. Acrylic Bondcrete, The Burke Co.
      2. Day-Chem Ad Bond, Dayton Superior Corp.
      3. SBR Latex, Euclid Chemical C.
      4. Daraweld C, W.R. Grace & Co.
      5. Hornweld, A.C. Horn, Inc.
      6. Everbond, L&M Construction Chemicals, Inc.
      7. Acryl-Set, Master Builders Inc.

8. Intralock, W.R. Meadows, Inc.
9. Sonocrete, Sonneborn-Chemrex

M. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Resi-Bond (J-58), Dayton Superior
      b. Euco Expoxy System #452 or #620, Euclid Chemical Co.
      c. Expoxtite Binder 2390, A.C. Horn, Inc.
      d. Epabond, L&M Construction Chemicals, Inc.
      e. Concresive Standard Liquid, Master Builders, Inc.
      f. Rezi-Weld 1000, W.R. Meadows, Inc.
      g. Sikadur 32 Hi-Mod, Sika Corp.

N. Interior Epoxy Sealer: Use a maximum 35 percent type.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Epoxy-Plus, Dayton Superior Inc.
      b. Eucopoxy 1, Euclid Chemical
      c. Oauerseal 30E; Non-Crete, Inc.
      d. Rescon R117; Symons Corp.
      e. Son-No-Mar; Sonneborn Div./Chem Rex Inc.
      f. Super Seal 32; L&M Construction Chemicals, Inc.

O. V.O.C. Compliant Urethane Sealer:
   1. Day Chen Urethane V.O.C. (J-39); Dayton Superior Inc.

2.05 PROPORTIONING AND DESIGING MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial mixtures or field experience methods as specified in ACI 318-89 Section 5.3. If trial mixtures method used, use and independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Trial mix designs and strength tests, made by qualified independent material laboratory, in accordance with ACI 318-89 Section 5.3 are required for the following types of concrete:
   1. Normal weight concrete with specified strength in excess of 4000 psi.
   2. All concrete design for which a suitable experience record is not available.

C. Mix design based on a record of past performance in accordance with ACI 318-89 Section 5.3, may be provided by qualified concrete supplier or precast concrete manufacturer for concrete designs. Mix design shall be certified by an independent testing laboratory.

D. All concrete mix designs shall include the following information:
   1. Proportions of cement, fine and course aggregate and water.
   2. Water/cement ratio, design strength, slump and air content.

3. Type of cement and aggregates.
4. Type and dosage of all admixtures.
5. Type, color, and dosage of integral coloring compounds, where applicable.
6. Special requirements for pumping.
7. Any special characteristics of the mix which require precautions in the mixing, placing, or finishing techniques to achieve the finished products specified.

E. Submit written reports to Architect 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 by Architect.

F. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:
1. 5000-psi, 28-day compressive strength.
2. 4000-psi, 28-day compressive strength.
3. 3000-psi, 28-day compressive strength.

G. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
1. Subjected to freezing and thawing: W/C 0.45.
2. Subjected to deicers/watertight: W/C 0.40.
3. Subjected to brackish water, salt spray, or deicers: W/C 0.40.

H. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Ramps and sloping surfaces: Not more than 3 inches.
2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to 3-inch slump concrete.
4. Other concrete: Not more than 5 inches or less than 3 inches.

I. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

2.06 ADMIXTURES:

A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

C. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water cement ratios below 0.50.

D. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:

1. Concrete structures and slabs exposed to freezing and thawings, deicer chemicals, or hydraulic pressure.

a. 5.0 percent (moderate exposure); 6.0 percent (severe exposure) for ¾-inch maximum aggregate.

b. 5.5 percent (moderate exposure); 7.0 percent (severe exposure) for ½-inch maximum aggregate.

2. Other concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 to 4 percent air.

E. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.07 CONCRETE MIXING:

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg.F (30 deg.C) and 90 deg.F (32 deg.C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg.F (32 deg.C), reduce mixing and delivery time to 60 minutes..

PART 3 – EXECUTION

3.01 GENERAL:

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.02 FORMS:

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Formwork drawings shall bear the seal and signature of a Professional Engineer registered in the State of Alabama. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.

2. Provide Class C tolerances for other concrete surfaces.

Care shall be taken with the formwork on the bottom of the slabs, which will be exposed ceilings, to avoid the need for patching or repairs following the removal of the formwork.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.03 VAPOR RETARDER/BARRIER INSTALLATION:

A. General: Place vapor retarder/barrier sheeting in position with longest dimension parallel with direction of pour.

B. Lap joints 6 inches and seal with manufacturer's recommended mastic or pressure-sensitive tape.

3.04 PLACING REINFORMENT:

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.05 JOINTS:

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.

F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Joint fillers and sealants are specified in Section 07900, "Sealants and Joint Fillers".

G. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts ¼ inch wide by one-fourth of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
3. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
4. Joint fillers and sealants are specified in Division 7 Section "Joint Sealants".

3.06 INSTALLING EMBEDDED ITEMS:

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown in lintels, relieving angles, and other conditions.

C. Install dovetail anchor slots in concrete structures as indicated on drawings.

D. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.07 PREPARING FORM SURFACES:

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.08 CONCRETE PLACMENT:

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machines. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations
3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40 deg.F (4 deg.C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg.F (10 deg.C) and not more than 80 deg.F (27 deg.C) at point of placement.

1. Do not use frozen material or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg.F (32 deg.C). Mixing water may be chilled 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. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.09 FINISHING FORMED SURFACES:

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and finish and other projections exceeding ¼ inch in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, veneer plaster, painting or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Care shall be taken with the formwork on the bottom of the slabs, which will be exposed ceilings, to avoid the need for patching or repairs following the removal of the formwork. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than 1 day after form removal.

1. 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.

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 MONOLITHIC SLAB FINISHES:

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tiles, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.

1. After placing slabs, finish surface to tolerances specified in Section 3.11. Slope surfaces uniformly to drain where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-drive floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to

power units. Finish surfaces to tolerances specified in Section 3.11. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances specified in Section 3.11. Grind smooth any surface defects that would telegraph through applied floor covering system.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.

E. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 FLOOR FLATNESS/LEVELNESS REQUIREMENTS:

A. After placing slabs, finish surface to the following tolerances of F(F) (floor flatness) and F(L) (floor levelness) measured according to ASTM E 1155:

FINISH	SLAB-ON-GRADE				FRAMED FLOOR	
	OVERALL		LOCAL		OVERALL	LOCAL
	FF	FL	FF	FL	FF	FF
Scratch Finish	18	15	15	13	25	22
Float Finish	20	17	17	15	25	22
Trowel Finish	25	22	22	19	25	22

Specified overall F-numbers apply to the whole floor taken as one. Minimum local F-numbers apply to each slab, bounded by construction joints.

3.12 MISCELLANEOUS CONCRETE ITEMS:

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, 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 shown or required to complete 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 to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.13 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer ‘s instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

1. Provide moisture curing by the following methods:
    a. Keep concrete surface continuously wet by covering with water.
    b. Use continuous water-fog spray.
    c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
2. Provide moisture-retaining cover curing as follows:
    a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
    a. Apply curing compound to concrete slab as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer’s directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
    b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

D. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

E. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

1. Final cure concrete surface to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.14 SHORES AND SUPPORTS:

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as specified.

B. Shoring requirements shall be designed by a Professional Engineer registered in the State of Alabama. All designs shall be submitted to the Architect bearing the seal and signature of the Professional Engineer.

C. Extend shoring from ground to roof for structures four stories or less unless otherwise permitted.

D. Extend shoring at least three floors under floor or roof being placed for structures over four stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

E. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

F. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

G. For concrete exposed to view, all formwork shall be tight to prevent leaks and fins.

3.15 REMOVING FORMS:

A. General: Formwork not supporting weight of concrete such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg.F (10 deg.C) for 24 hours after placing concrete provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by resting field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.16 REUSING FORMS:

A. 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-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.17 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs rock pockets, voids over ¼ inch in any dimensions, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas 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.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove, and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces 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. Proprietary underlayment compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least ¾-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

F. Repair methods not specified above may be used, subject to acceptance of Architect.

3.18 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. General: The Owner will employ a testing agency to perform tests and to submit test reports.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.
   1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
      a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
      b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
      c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg.F (4 deg.C) and below, when 80 deg.F (27 deg.C) and above, and one test for each set of compressive-strength specimens.
      d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mod and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

C. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. Yd. more than the first 24 cu. Yd. of each concrete class placed in any one day, or for each 5000 sq ft of surface are placed; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
   1. Any additional cylinder required by the Contractor for early strength gain test for form stripping or post-tensioning are Contractor's responsibility and shall be paid for by the Contractor.
   2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each bath if fewer than five are used.
   3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
   4. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
   5. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete bath in structure, design compressive strength at 28 days, concrete mis proportions and materials, compressive breaking strength, and type of break for both 7-day tests.
   6. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
   7. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF CAST-IN-PLACE CONCRETE

SECTION 03 3660
SEALED CONCRETE FLOOR

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Floors denoted on Finish Schedule as SC (Sealed Concrete).
   2. Furnish all labor, materials, equipment and services necessary for grinding and sealing concrete floors.
   3. PROTECTION OF CONCRETE SLABS DURING CONSTRUCTION.

1.02 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General Conditions and Division 1 Specification Sections, apply to the work of this Section.

B. Section 03 3000 - Cast-in-Place Concrete: Concrete materials, placing, and finishing.

C. Section 03 3010 - Cast-in-Place Concrete for Exposed Concrete Floors.

D. Section 03 3680 - Concrete Polishing.

1.03 SUBMITTALS

A. Contractor shall submit specified manufacturer's complete technical data sheets for all products to be used, including installation instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of specified sealer shall have a minimum TEN (10) years experience in the production of the specified products.

B. Contractor Qualifications: Contractor must have a minimum FIVE (5) years experience in sealing applications and successfully completed not less than SIX (6) projects comparable in scale and complexity.

C. Regulatory Requirements
   1. Products shall comply with the United States Clean Air Act for maximum Volatile Organic Compound (VOC) content as specified in PART 2 of this section.

D. Mockups and Field Samples: Prepare field sample at project site for architects review and approval.
   1. Samples shall be constructed on site and shall be 4'x4'. If there is existing concrete, the Architect shall select an area where the samples will be placed.
   2. Construct sample-using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in sample panels.
   3. Sample shall be sealed by the individual workers who will actually be performing the work for the project.
   4. Obtain written approval of the sample from project Architect before start of work.
   5. Retain approved samples through completion of the work for use as a quality standard for finished work.
   6. The mockup may remain part of the finished work if approved.

E. Mandatory Pre-Pour Installation Conference: Conduct conference at project site to comply with requirements in Section 01 0150 - Special Conditions.

F. Protection: General Contractor shall protect areas to receive polished concrete finishes at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:
   1. General Contractor to apply Ram Board or Econo-Cover temporary surface protection.
   2. All hydraulic powered equipment shall be diapered to avoid staining of the concrete.
   3. All vehicle parking shall be prohibited on the finish slab area. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
   4. No pipe cutting machine shall be used on the finished floor slab.
   5. Steel shall not be placed on the finish slab to avoid rusting.
   6. Acids and acidic detergents will not come in contact with slab.

7. All painters will use drop cloths on the concrete. If paint gets on the concrete, it must be immediately removed.
8. All trades will be informed that the slab must be protected at all times.

G. Environmental Limitations
1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting chemical performance.
2. Flatness and levelness
   a. Finish Concrete shall have a minimum Floor Flatness rating of at least **45**.
   b. Finish Concrete shall have a minimum Floor Levelness rating of at least **35**.
   c. Finish Concrete shall be cured a minimum of 28 days or at which point equipment can be put on the slab and does not displace aggregate.
3. Application of finish system shall take place a minimum of 21 days prior to fixture & trim installation and/or substantial completion.
4. Finish Concrete area shall be closed to traffic during finish floor application and after application, for the time as recommended by manufacturer.

H. Concrete Mix Design:
1. Concrete Mixture shall be 4,000 PSI or higher, non-air entrained.
   a. Any admixtures, plasticizers, slag, fly ash or anything taking the place of Portland-based cement shall be kept to a minimum.
   b. The cement shall be Portland Cement Type I, conforming to ASTM C 150.
   c. Maintain concrete temperature below 85 degrees. Keep concrete as cool and moist for as long as possible. In essence, decrease rate of hydration and drying to minimize cracking.
   d. Wet cures are most suitable, but if this cannot be achieved, use a dissipating cure and seal only.
   e. All mix designs must be approved by Architect. Send all approved mix designs to Installer/Applicator.
   f. The Engineer/Architect shall determine the saw cut pattern, color and layout.
   g. Color loads for integral color should never be smaller than three (3) cubic yards.
   h. Use one (1) source for cement, aggregates and pozzolans throughout the job. Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.
   i. Wash out all drums before loading. Keep slumps consistent with a maximum of four (4). Minimize driver added water maintaining a .45 water content ratio.
   j. Place concrete to achieve as true and smooth a top surface as possible. Mounds, or dips are not acceptable. GC shall control overall flatness and levelness, including on sloping areas to within tolerances permitted by specification - ASTM E1155.
   k. Slab shall be protected from indention and footprints during pour and curing.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.

B. Store specified products in conditions recommended by the manufacturer.

1.06 JOB SITE CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature of between 50° F and 90° F during application and at least 48 hours after application.

B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Euclid Chemical: www.euclidchemical.com.

B. Ameripolish 3D HS; Ameripolish, Inc.

C. Prosoco, Inc.: www.prosoco.com.

D. Dayton Superior Corporation: www.daytonsuperior.com.

E. Substitutions: See Section 01600 - Product Requirements.

2.02 PRODUCTS

A. Densifier: a concrete hardener chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.
   1. Basis of Design: EUCO Diamond Hard.

B. Control Joint and Saw Cut Filler, two part polyurea.
   1. Hi-Tech HT-PE85; Hi-Tech Systems.
   2. Spal-Pro RS-88; Metzger/McGuire.
   3. Euclid QuickJoint 200, (Grey Only); Euclid Chemical Company.

C. Substitutions: The use of any products other than those specified will be considered providing that the contractor requests its use in writing within fourteen (14) days prior to bid date. This request shall be accompanied by:
   1. A certificate of compliance from the material manufacturer stating that the proposed products meet or exceed the requirements for this specification.
   2. Documented proof that the proposed material has a five (5) year proven record of performance for sealing, hardening and densifying concrete substrates, confirmed by at least two (2) local projects that the Architect can examine.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. New Concrete
   1. Apply sealer/densifier immediately after final finishing and installation of control joints (if manufacturer's recommendations permit); when the concrete surface won't be marred by foot traffic and after joints have been cut and cleaned or anytime thereafter. Remove soft cut saw debris prior to applying sealer/densifier. Surface shall be swept, and mopped or
   2. pressure-washed as necessary to insure no dirt, grit, trash, or similar items mar finished product. Remove all markings, including paint, marker or pencil marks. Inspect floor surface prior to application to be sure it is ready for sealer/densifier.

B. Existing Concrete
   1. Remove all dirt, debris, or curing compounds using appropriate surface prep cleaner. Allow cleaning waters used in surface preparation to dry.

C. Final Saw-Cutting
   1. Layout and cut precise edges at over-poured floor depressions and slab edges and remove excess concrete material to the depth of the depression.

3.03 APPLICATION OF SEALER

A. New Concrete
   1. The surface shall be sealed with a sealer produced of the type specified under Products above.
      a. Also apply manufacturer's protection coat as specified above.
   2. Apply at the rates and method recommended by manufacturer in written instructions which the installer shall have at the job site.
   3. Apply a single coat using low pressure sprayer fitted with 0.5 gal/min spray tip. Lightly apply sufficient product to wet the surface without producing puddles. Use clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.

4. If surfaces dry immediately, increase the rate of application. Surfaces should remain wet 5 to 10 minutes. Adjust rate of application to eliminate puddles. Any white residue must be removed immediately.
5. Allow treated surfaces to dry.
6. For uncured steel troweled concrete, immediately apply the specified curing compound or initiate specified curing procecure.
7. When the curing process is complete, use an automatic floor scrubber equipped with cleaning pads or brushes appropriate for removal of accumulated construction soiling and surface residues. Avoid pads or brushes which may damage the finished floor.

B. Existing Concrete
1. The surface shall be sealed with a sealer produced of the type specified under Products above.
   a. Also apply manufacturer's protection coat as specified above.
2. Apply at the rates and method recommended by manufacturer in written instructions which the installer shall have at the job site.
3. Apply a single coat using low pressure sprayer fitted with 0.5 gal/min spray tip. Lightly apply sufficient product to wet the surface without producing puddles. Use clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
4. If surfaces dry immediately, increase the rate of application. Surfaces should remain wet 5 to 10 minutes. Adjust rate of application to eliminate puddles. Any white residue must be removed immediately.
5. Allow treated surfaces to dry.
6. Remove any dried powder residue using a stiff broom, power sweeper, or auto-scrubbing machine.
7. Dry-Buff or burnish concrete surface in both directions with orbital floor machine or burnisher equipped with appropriate polishing pad for additional surface sheen.

3.04 PROTECTION

A. Protection: General Contractor shall protect areas to receive sealed concrete finish at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured.

B. Do not allow any trade to park any vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.

C. Diaper all hydraulic powered equipment to avoid staining of the concrete.

D. Place no steel on interior slab to avoid rust stains and gouges. If construction dictates necessity of this, interior slab will be protected with 1/2-inch plyboard.

E. Do not allow acids and acidic detergents to come into contact with slab.

F. Inform all trades that the slab must be protected at all times.

G. Protect finished work until fully cured in accordance with manufacturer's recommendations.

H. Protect completed floor from damage until Substantial Completion.
1. Do not allow vehicle and pedestrian traffic on unprotected floor.
2. Do not allow construction materials, equipment, and tools on unprotected floor.

I. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed floor.

J. Repair damaged areas of completed floor to satisfaction of Architect.

K. Protect floor from traffic for at least 72 hours after final application of sealer.

L. Plywood slab protection in traffic corridors, entry ways, and areas to receive sealer shall be provided by and maintained by General Contractor throughout construction until the finishing contractor takes ownership of the floor. Protection shall be sufficient to protect surface from damage due to traffic and impact from any and all construction activities with a minimum of 1/2" plywood. All seams of plywood shall be sealed to eliminate passage of debris to new floor.

M. Protect slab during masonry work and after completion of sealer work with minimum of 1/2-inch plyboard, with sealed seams.

N. Upon completion of sealer, the General Contractor and the finishing subcontractor shall replace the plywood protection for the duration of the project.

3.05 MAINTENANCE

A. Sealed floors should be maintained by sweeping. Spills should be cleaned when they occur and dirt shall be rinsed off with water. Heavily soiled areas may be wet-cleaned by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Interior floors that require polishing should be maintained using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

END OF SECTION

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SECTION 03 3680
CONCRETE POLISHING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes polished concrete finish for interior concrete floors denoted on Finish Schedule as PC (Polished Dyed Concrete).

B. Furnish all labor, material, equipment and services necessary for the dry diamond grinding and polishing of concrete floors.

C. Applying densifying impregnator/sealer and polishing to specified sheen level and aggregate exposure.

D. Concrete must be cured a minimum of 28 days prior to polishing.

E. PROTECTION OF CONCRETE SLABS DURING CONSTRUCTION.

1.02 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 03 3000 - Cast-in-Place Concrete: Concrete materials, placing, and finishing.

C. Section 03 3010 - Cast-in-Place Concrete for Exposed Concrete Floors.

D. Section 03 3660 - Sealed Concrete Floors.

1.03 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI302.1R-89, Guide for Concrete Floor and Slab Construction.

B. American Society for Testing and Materials:
   1. ASTM C779, Standard Test Method for Abrasion of Horizontal Concrete Surfaces.
   2. ASTM C805, Impact Strength.
   3. ASTM G23-81, Ultraviolet Light & Water Spray.
   4. ASTM 1028, Co-efficient of Friction.
   5. ASTM C 150, Type I, II Portland cement conformity, depending on soil conditions.
   6. ASTM C 33, Aggregate conformity.

C. Other Tests:
   1. Reflectivity.

1.04 SUBMITTALS

A. Submit the following in accordance with Submittal Procedures in Division 1 Sections.

B. Product data for concrete densifying impregnator, penetrating sealer, concrete dyes, joint filler and any other chemicals used in the process.

C. Applicators qualification data.

D. Polished concrete samples: size 3"x3" for each Polished Concrete finish required.

E. Maintenance procedures for Polished Concrete using diamond impregnated cleaning pads.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of specified sealer shall have a minimum TEN (10) years experience in the production of the specified products.

B. Contractor Qualifications: Contractor must have a minimum FIVE (5) years experience in sealing applications and successfully completed not less than SIX (6) projects comparable in scale and complexity.
   1. Installer/applicator shall be certified by concrete grinding/polishing equipment, chemical manufacturer and caulking manufacturer. Installer/applicator shall provide adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.

2. Manufacturer's Certification: Provide a letter of certification from both the equipment and chemical manufacturer stating that the installer is a Certified Contractor and is familiar with proper procedures and installation requirements recommended by the manufacturer.
3. Provide project names, addresses, contact names, phone numbers of at least SIX (6) projects of similar scope and size completed by the installer.

C. Mock-ups:
1. General Contractor to notify applicator 7 days prior to pour to schedule finish of mock-up.
2. Reserve 100 square feet for each color and finish at location adjacent to floor that will receive polish, but will be covered with another flooring material. Mock-up floor shall be placed on the same day, preferably the same pour as the floors to receive polish.
3. Install mock-ups to verify selections made under sample submittal and to demonstrate methods and workmanship proposed for the project. If mock-up not possible, submitted samples will be accepted as demonstrated methods & workmanship.
4. If stand-alone mockup required, form should be clean and free from extraneous substance and be at least a 10' x 10' with a level plywood bottom on level ground with unobstructed access around all four sides.
5. Control joints should be included in mock-up. Sawing performed by General Contractor can begin as soon as the surface is firm enough not to displace any of the aggregate.
6. Edges should be included in mock-up.
7. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.
8. Provide protection for Mock-up as specified for finished areas.

D. Mandatory Pre-Pour Installation Conference: Conduct conference at project site to comply with requirements in Section 01 0150 - Special Conditions.

E. Protection: General Contractor shall protect areas to receive polished concrete finishes at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:
1. General Contractor to apply Ram Board or Econo-Cover temporary surface protection.
2. All hydraulic powered equipment shall be diapered to avoid staining of the concrete.
3. All vehicle parking shall be prohibited on the finish slab area. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
4. No pipe cutting machine shall be used on the finished floor slab.
5. Steel shall not be placed on the finish slab to avoid rusting.
6. Acids and acidic detergents will not come in contact with slab.
7. All painters will use drop cloths on the concrete. If paint gets on the concrete, it must be immediately removed.
8. All trades will be informed that the slab must be protected at all times.

F. Environmental Limitations:
1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting chemical performance.
2. Flatness and levelness:
   a. Finish Concrete shall have a minimum Floor Flatness rating of at least **45**.
   b. Finish Concrete shall have a minimum Floor Levelness rating of at least **35**.
   c. Finish Concrete shall be cured a minimum of 28 days or at which point equipment can be put on the slab and does not displace aggregate.
3. Application of finish system shall take place a minimum of 21 days prior to fixture & trim installation and/or substantial completion.
4. Finish Concrete area shall be closed to traffic during finish floor application and after application, for the time as recommended by manufacturer.

G. Concrete Mix Design:
1. Concrete Mixture shall be 4,000 PSI or higher, non-air entrained.

a. Any admixtures, plasticizers, slag, fly ash or anything taking the place of Portland-based cement shall be kept to a minimum.
b. The cement shall be Portland Cement Type I, conforming to ASTM C 150.
c. Maintain concrete temperature below 85 degrees. Keep concrete as cool and moist for as long as possible. In essence, decrease rate of hydration and drying to minimize cracking.
d. Wet cures are most suitable, but if this cannot be achieved, use a dissipating cure and seal only.
e. All mix designs must be approved by Architect. Send all approved mix designs to Installer/Applicator.
f. The Engineer/Architect shall determine the saw cut pattern, color and layout.
g. Color loads for integral color should never be smaller than three (3) cubic yards.
h. Use one (1) source for cement, aggregates and pozzolans throughout the job. Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.
i. Wash out all drums before loading. Keep slumps consistent with a maximum of four (4). Minimize driver added water maintaining a .45 water content ratio.
j. Place concrete to achieve as true and smooth a top surface as possible. Mounds, or dips are not acceptable. GC shall control overall flatness and levelness, including on sloping areas to within tolerances permitted by specification - ASTM E1155.
k. Slab shall be protected from indention and footprints during pour and curing.

PART 2 - PRODUCTS

2.01 POLISHING MATERIALS

A. Three-phase 480 Volt generator.

B. 3 head or 4 head counter rotating, variable speed, electric floor grinding/polishing machines with at least 600 pounds down pressure. For example: HTC 950RX, HTC 800 HD, SASE PDG 8000, Husqvarna PG 820. No substitutions allowed.

C. HTC/Pullman Dust extraction system, pre-separator, and squeegee attachments with minimum flow rating of 322 cubic feet per minute such as the HTC 75D, HTC 86D, T8600, T12600, Bull 500, Bull 1250 & T55 or C5500. No substitutions allowed.

D. Grinding tools:
1. Metal bonded diamonds 40, 80 and 150 metal or QuickCut transitional.
2. Resin bonded diamonds 100, 200, 400 and 800 grits.

E. Grinding Pads for Edges:
1. Metal bonded diamonds 50 and 100 grits.
2. Resin bonded diamonds 100, 200, 400 and 800 grits.

F. Hand Grinder with dust extraction attachment and pads.

G. Densifier: A concrete hardener chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.
1. Ameripolish 3D HS; Ameripolish, Inc.
2. Consolideck LS; PROSOCO
3. Scofield Formula One MP; Sika/Scofield
4. No substitutions allowed.

H. Control Joint and Saw Cut Filler, two part polyurea.
1. Hi-Tech HT-PE85; Hi-Tech Systems
2. No substitutions allowed.

I. Dye: A penetrating dye that chemically combines with cured concrete to produce permanent, variegated or translucent color effects.
1. Ameripolish Dye; Ameripolish, Inc.
2. Gemtone Stain; PROSOCO
3. No substitutions allowed.

J. Penetrating Stain Guard: Protection from debris and contaminants
   1. Ameripolish 3D SP; Ameripolish, Inc.
   2. Consolideck LS Guard; PROSOCO
   3. Scofield Formula One Guard-W; Sika/Scofield
   4. No substitutions allowed.

K. Stain Resistor/Inhibitor: Additional protection for food service areas.
   1. Ameripolish SR2 Stain Resistor; Ameripolish, Inc.
   2. Consolideck Concrete Protector; PROSOCO
   3. No substitutions allowed.

L. Diamond Impregnated Burnishing Pads
   1. Trifecta Pads; SASE Company, Inc.
   2. Twister Pads; HTC
   3. HiperClean Pads; Husqvarna
   4. No substitutions allowed.

M. Epoxy Floor Coatings: Type recommended by the manufacturer for this application.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installer shall examine and approve concrete substrate for conditions affecting performance of finish. General Contractor shall correct conditions that are found to be out of compliance with the requirements of this section. Repairs are not acceptable unless specifically approved on a case-by-case basis by the Architect.

B. Verify that base slab meet finish and surface profile requirements listed in Division 3, Section “Cast in Place Concrete”.

C. Provide floor clean of materials and debris.

D. Protect adjacent surfaces as required to prevent damage by the concrete polishing procedure.

E. Setup grinding machine, dust extraction system, tooling, and generator.

F. Ensure floor cured to accept polishing application.

G. Final Saw-Cutting:
   1. Layout and cut precise edges at over-poured floor depressions and slab edges and remove excess concrete material to the depth of the depression.

3.02 POLISHED CONCRETE APPLICATION

A. Applicator shall examine the areas and conditions under which work of this section will be provided and the General Contractor shall correct conditions detrimental to the timely and proper completion of the work and the Applicator shall not proceed until unsatisfactory conditions are resolved.

B. Fill construction joints and cracks with filler products as specified in accordance with manufacturer’s instructions colored to match (or contrast) with concrete color as specified by architect. All control joint and decorative saw cut filling must be performed prior to grinding application.

C. Saw cut recessed floor mat and recessed tile slab edges to final dimension at locations of overpoured conrete. Remove excess concrete to depth of recess.

D. Grind the concrete floor to within 2 -3 inches of wall with 40 grit metal, 80 grit metal and 150 grit metal or QuickCut transitional diamonds removing construction debris, floor slab imperfections and until there is a uniform scratch pattern and desired concrete aggregate exposure is achieved. Each subsequent grind shall be at 90 degrees from each previous grind and remove all the scratches from the previous grind. Vacuum the floor thoroughly using a squeegee vacuum attachment. Utilize the least aggressive diamond tooling necessary to remove all debris and to achieve uniform scratch pattern. Final surface finish to be salt and pepper.

E. Grind the edges with 50 and 100 grit metal grinding pads, prior to grinding the floor with each step on the larger diamond grinder, removing all of the scratches from the previous grit. Vacuum the floor thoroughly after each grind, using a squeegee vacuum attachment.

F. Polish the floor with resin bonded diamond grits of 100, 200, 400, first polishing the edges with pads of the same grit and then the field of the floor, removing all scratches from the previous grit. After each polish, clean the floor thoroughly using a vacuum with a squeegee attachment. After the 400 grit polishing step thoroughly clean the floor with a mop or auto-scrubber.

G. If specified, apply dye color per manufacturer's recommendations. Apply two coats of dye to achieve desired coloration.

H. Apply densifying impregnator undiluted as per manufacturer's specifications and guidelines. Cover the entire work area liberally and allow to sit for 10 minutes. Apply again to areas where the densifying impregnator has soaked in and allow to sit for an additional 30 minutes. Squeegee excess material off the floor.

I. Polish the floor with resin bonded diamond grit of 800, first polishing the edges with pads of the same grit and then the field of the floor, removing all scratches from the previous grit. After polishing, clean the floor thoroughly using clean water and an auto-scrubber or a mop and a wet vacuum.

J. Apply Penetrating Stain Guard with a microfiber applicator and burnish with a fine, 800 grit, or very fine, 1500 grit, diamond impregnated polishing pad.

K. Where required, apply Stain Resistor/ Inhibitor with a microfiber applicator and burnish with a fine, 800 grit, or very fine, 1500 grit, diamong imprednated burnishing pad.

L. Upon completion, the work shall be ready for final inspection and acceptance by the customer.

3.03 PROTECTION

A. General Contractor to apply Skudo LT (Light Traffic), Ram Board or Econo-Cover temporary surface protection.

B. Do not allow any trade to park any vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.

C. Diaper all hydraulic powered equipment to avoid staining of the concrete.

D. Protect slab after completion of polishing and dyeing work with Ram Board floor protection cover, Econo-Cover or equal. Overlap and tape seams.

E. Place no steel on interior slab to avoid rust stains and gouges. If construction dictates necessity of this, interior slab will be protected with 1/2-inch plyboard.

F. Do not allow acids and acidic detergents to come into contact with slab.

G. Inform all trades that the slab must be protected at all times.

H. Protect finished work until fully cured in accordance with manufacturer's recommendations.

I. Protect completed floor from damage until Substantial Completion.
   1. Do not allow vehicle and pedestrian traffic on unprotected floor.
   2. Do not allow construction materials, equipment, and tools on unprotected floor.

J. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed floor.

K. Protect floor from traffic for at least 24 hours and from water for at least 72 hours after completion of polishing and dyeing.

PART 4 - SCHEDULES

4.01 SHEEN

A. Polished Concrete Level 1 - 400 grit (Matte Finish):
   1. At a distance of 30 to 50 feet, the floor will receal moderate light reflection.
   2. Yield an average gloss reading of 20 - 40, as measured by a Horiba Gloss Meter.

B. Polished Concrete Level 2 - 800 grit (Medium Gloss Finish):
   1. At a distance of 30 to 50 feet, the floor will reveal moderate light reflection.
   2. Yield an average gloss reading of 40 - 60, as measured by a Horiba Gloss Meter.

4.02 EXPOSED AGGREGATE

A. Minimal exposure, Salt and Pepper

4.03 DYE COLOR

A. See finish schedule for dye color(s).

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Concrete building brick.

C. Clay facing brick.

D. Mortar and grout.

E. Reinforcement and anchorage.

F. Flashings.

G. Lintels.

H. Accessories.

I. Water Repellent and Efflorescence Control Admixtures.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract including Supplementary Conditions and Division 01 Specification Sections apply to the Section.

B. Section 01 2100 - Allowances: Face Brick Allowance.

C. Section 01 4000 - Quality Requirements: Requirements for Mock-ups.

D. Section 03 3660 - Sealed Concrete Floor: Protection of concrete slabs during masonry work.

E. Section 03 3680 - Concrete Polishing: Protection of concrete slabs during masonry work.

F. Section 03 3931 - Curing, Sealing, and Hardening Concrete Floors: Protection of concrete slabs during masonry work.

G. Section 05 5000 - Metal Fabrications: Loose steel lintels.

H. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.

I. Section 07 1113 - Bituminous Dampproofing: Dampproofing parged masonry surfaces.

J. Section 07 1400 - Fluid Applied Air Barriers: Spray-applied Air Barriers on masonry surfaces.

K. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.

L. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

M. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2100 - Allowances, for cash allowances affecting this section.

B. All requirements of this Section shall be included in the Contract Sum/ Price except the specific item itemized in the following enumerated paragraph.

1. Allowance No. 01 - Brick Veneer Masonry: This allowance includes purchase and delivery of face brick veneer material. Installation is not included in the allowance but is specified in this Section and is part of the Contract Sum/Price.

1.04 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 A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

G. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

H. 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, with Editorial Revision.

I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

J. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.

K. ASTM C55 - Standard Specification for Concrete Building Brick; 2023.

L. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

M. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.

N. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.

O. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

P. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

Q. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

R. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

S. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars; 2022.

T. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

U. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.

V. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

W. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

X. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

Y. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale); 2022.

Z. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.

AA. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.

BB. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2023b.

CC. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

DD. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

EE. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

FF. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

GG. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

HH. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

II. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 ADMINISTRATIVE REQUIREMENTS

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

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
   1. Include calculations or selections from the manufacturer's prescriptive design tables that indicate compliance with the applicable building code and project conditions.
   2. Include the design engineer's stamp or seal on each sheet of shop drawings.

D. Samples: Submit four 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. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

G. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Fire Rated Assemblies: Comply with applicable code for UL requirements for fire rated masonry construction.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum five years of documented experience.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience with demonstrated relevant experience defined as having successfully completed a minimum of five (5) projects of similar size and complexity. Where requested by the Architect, the Subcontractor shall furnish the names and contact information for the General Contractors for relevant experience confirmation.

E. Single Source Responsibilities.
   1. Water Repellents: Obtain each type of integral water repellant from a single manufacturer for the entire project.
      a. Compatibility Confirmation: Verify water repellent is compatible with all masonry wall system compenents including, but not limited to, flashings and coatings, facing brick and masonry units, mortars and grouts. Notify Architect in writing in detail of any non-compatible products prior to any application of the product and await Architect's instruction before proceeding.
   2. Through-Wall Flashings: Self-adhering membrane flashings associated with through-wall flashings in the Section shall be manufactured by the manufacturer of the Air/ Water Barrier specified in Section 07 1400 - Fluid Applied Air Barrier for material compatibility and single-source manufacturing responsibility.

1.08 MOCK-UPS

A. Integrate materials of this Section into the Exterior Assembly Mock-up per the drawing requirements, including mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

C. Mock-up may not remain as part of work.

1.09 DELIVERY, STORAGE, AND HANDLING

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

B. Store cementitous material and insulation off the ground and under cover in a dry location.

C. Store aggregates where grading and similar required characteristics can be maintained and contamination avoided.

D. Store masonry accessories in a manner that prevents accumulation of dirt and oil.

E. Store water repellants in strict accordance with manufacturer's printed instructions.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ ASCE 6/ TMS 602 and applicable Building Code.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Special Shapes: Provide nonstandard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
   3. Load-Bearing Units: ASTM C90, lightweight or normal weight as required.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture.
      c. Unit Compressive Strength: Provide units with minimum compressive strength as indicated on the drawings.
      d. Provide normal weight units where required for compliance with UL Rated Assemblies at fire-rated walls and partitions.
   4. Nonloadbearing Units: ASTM C129, lightweight or normal weight as required.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture.
      c. Unit Compressive Strength: Provide units with minimum compressive strength as indicated on the drawings.
      d. Provide normal weight units where required for compliance with UL Rated Assemblies at fire-rated walls and partitions.

B. Concrete Brick:
   1. Size: As indicated on drawings.
   2. Concrete Building Brick: ASTM C55; lightweight, solid, for interior or concealed use.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBX, Grade SW, except where MW permitted by reference standard.
   1. Facing Brick material shall be purchased under an Allowance item. See Section 01 2100 - Allowances.
   2. Color and texture: To be selected by Architect..
   3. Nominal size: Standard Modular, unless noted otherwise.
   4. Special shapes: **Molded units as required by conditions indicated in drawings.**
   5. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.
   6. **For sills, caps and similar applications resulting in exposure to brick surfaces which otherwise would be concealed from view, provide uncored or unfrogged units with all exposed surfaces by sawing.**

2.03 MORTAR AND GROUT MATERIALS

A. Manufacturers:
   1. Argos US; www.argos-us.com..
   2. Amerimix; www.amerimix.com..
   3. Lehigh Hanson; www.lehighhanson.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Colored Masonry Cement: ASTM C91/C91M, Type N.

1. Colored Masonry Cement: Premixed cement as selected by Archtect from manufacturer's full sample range of at lease thirty (30) colors.

C. Portland Cement: ASTM C150/C150M, Type I.

D. Hydrated Lime: ASTM C207, Type S.

E. Mortar Aggregate: ASTM C144.

F. Grout Aggregate: ASTM C404.

G. Water: Clean and potable.

H. Accelerating Admixture: Nonchloride type for use in cold weather.

I. Water Repellent and Efflorescence Control Admixture for Mortar at Brick Veneer only: Polymeric liquid or powder admixture added to mortar at the time of manufacture compliant with ASTM E 514.
   1. Acceptable Products: Master Builders "MasterPel 240 Mortar Admizture", or equivalent.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Basis of Design: Hohmann & Barnard, Inc: www.h-b.com/#sle.
   2. Other Acceptable Manufacturers:
      a. WIRE-BONDwww.wirebond.com/#sle.
      b. York Manufacturing Inc.: www.york-mfg.com.
      c. Heckmann Building Products: www.heckmannbuilding products.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi), deformed billet bars; uncoated.

C. Joint Reinforcement: Use ladder type joint reinforcement unless truss type is specifically indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Product: 220 Ladder Mesh - SHD.
   2. Type: Ladder.
   3. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   4. Size: 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Product: 270-2X Ladder Eye-Wire - SHD.
   2. Type: Ladder, with adjustable ties or tabs spaced at 16 in on center.
   3. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   4. Size: 0.1875 inch side rods with 0.1875 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
   5. Vertical adjustment: Not more than 1 1/4 inches.
   6. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

F. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 3/16 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
   1. Product: 344 Rigid Partition Anchor.

G. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
   1. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.024 in thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
      a. Product: 305 Dovetail Slot with 315 Flexible Dovetail Brick Tie.

2. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
   a. Product: 359 Weld-on Anchor Rod with 301W Column Web Ties.

H. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.
   1. Product: HB-5213 Adjustable Veneer Anchor.
   2. Anchor plates: Not less than 0.105 inch 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.
   3. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   4. Vertical adjustment: Not less than 1-1/4 inches.

I. 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, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.
   1. Product: HB-213 Adjustable Veneer Anchor.
   2. Anchor plates: Not less than 0.105 inch 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.
   3. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   4. Vertical adjustment: Not less than 1-1/4 inches.

J. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.05 FLASHINGS

A. Manufacturers:
   1. Basis of Design: Hohmann & Barnard, Inc: www.h-b.com/#sle.
   2. Other Acceptable Manufacturers:
      a. WIRE-BONDwww.wirebond.com/#sle.
      b. York Manufacturing Inc.: www.york-mfg.com.
      c. Heckmann Building Products: www.heckmannbuilding products.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Flashing Materials:
   1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

C. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
   1. Stainless Steel/Polymer Fabric Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on inward facing side to a sheet of polymer fabric that has a clear adhesive with a removable release liner.
      a. Product: Mighty-Flash Stainless Flashing - SA.

D. Membrane Non-Asphaltic Flashing Materials:
   1. Application: Conditions where stainless steel flashings may corrode or adversely affect adjacent building products only.
   2. Product: Textroflash.
   3. Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil thick with pressure-sensitive adhesive and release paper.

E. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.
   1. Product: MFL Metal Flashing.
   2. Thickness: 26 gage.

F. 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.

G. Termination Bars: Stainless steel; compatible with membrane and adhesives.
   1. Product: T1 of T2 Terminiation Bar as applicable to condition.

H. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
   1. Product: MLF Metal Flashing.
   2. Thickness: 26 gage.

I. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

A. Manufacturers:
   1. Basis of Design: Hohmann & Barnard, Inc: www.h-b.com/#sle.
   2. Other Acceptable Manufacturers:
      a. WIRE-BONDwww.wirebond.com/#sle.
      b. York Manufacturing Inc.: www.york-mfg.com.
      c. Heckmann Building Products: www.heckmannbuilding products.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Product: RS Series Rubber Control Joints.
   2. Size: As required based on condition.

C. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; in maximum lengths available.
   1. Product: Backer Rod - Standard.
   2. Size: As required based on condition.

D. 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. Product: Mortar Trap.
   2. Size: As required based on condition.

E. Weeps:
   1. Product: 343 Weep Hole.
   2. Type: Molded PVC grilles, insect resistant.
   3. Color(s): As selected by Architect from manufacturer's full range.

F. Cavity Vents:
   1. Product: Quadro-Vent.
   2. Type: Molded PVC grilles, insect resistant.
   3. Color(s): As selected by Architect from manufacturer's full range.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type M.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.
   4. Interior, loadbearing masonry: Type S.
   5. Interior, non-loadbearing masonry: Type N.

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 or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

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.

D. Do not proceed until all unsatisfactory conditions have been corrected.

3.02 PREPARATION

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

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Masonry work shall be coordinated with electrical, mechanical, plumbing, and any other trade that will have in-wall work.

D. Where adjacent flooring is to receive concrete sealing and staining, polishing and/or dyeing, provide minimum 1/2" plywood protection over the floor slab, which should be protected under Section 03 3660 - Sealed Concrete Floor, and Section 03 3680 - Concrete Polishing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

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.
   3. Mortar Joints: Flush.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Raked.

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. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 48 inches on center horizontally below shelf angles and lintels and near top 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. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
   1. Verify that airspace width is no more than 3/8 inch greater than panel thickness.
   2. Hold cavity mortar control panel tight to face wythe.
   3. Install horizontally between joint reinforcement.
   4. Stagger end joints in adjacent rows.
   5. Fit to perimeter construction and penetrations without voids.

D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce joint corners and intersections with strap anchors 24 inches on center.

G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

H. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 32 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches 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, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:

1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
2. Anchor vertical leg of flashing into backing with a termination bar and sealant.
3. Apply cap bead of sealant on top edge of self-adhered flashing.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

E. Support flexible flashings across gaps and openings.

F. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.11 LINTELS

A. Install galvanized loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled in compliance with the requirements of the Structural drawings.

3.12 GROUTED COMPONENTS

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.13 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Horizontal bond beams and reinforcing shall continue through vertical masonry control joints.

C. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant. Use firestop materials at fire-rated walls, as specified.

D. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

E. Provide Control Joints at locations indicated, but not to exceed the following as continuous straight runs of masonry construction:
1. Exterior and Interior Brick Walls: 25' - 0" o.c. maximum continuous run of brick masonry.
2. CMU Walls: 25' - 0" o.c. maximum continuous run of CMU walls. Control joints shall not be within 4'-0" of any corner.
3. Corners: Control joints shall not be within 4'-0" from any corner, but shall be within a distance equal to half the control joint spacing.

F. Size control joints as indicated on drawings; if not indicated, 3/8" inch wide up to 16' - 0" spacing, 1/2" wide up to 22' - 0" spacing, and 5/8" wide up to 30' - 0" spacing.

G. Joints shall be clear of mortar. Seal with silicone sealant with optional compressible joint filler.

3.14 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.15 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

H. Maximum Variation for Vertical Alignment of Head Joints: 1/4 inch in 10 ft, 1/2" maximum.

3.16 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.17 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - 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.

3.18 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.

3.19 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. Protect masonry cavity during erection from exposure to rainfall each day until the cavity is permanently sealed.

C. Protect competed masonry work from staining and or damage from construction activities.

END OF SECTION

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SECTION 05 1200

STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Structural steel work including schedules, notes and details showing size and location of members, typical connections, and type of steel required.
2. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
3. Related work specified elsewhere:
   a. Miscellaneous Metal Fabrications are specified elsewhere in Division 5
   b. Refer to Division 3 for anchor bolt installation in concrete, Division 4 for anchor bolt installation in masonry.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 05500, "Metal Fabrications": Loose steel bearing plates and miscellaneous steel framing.

1.2 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Engineer structural steel members and connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

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.

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

1. Submit all shop drawings on one reproducible print (sepia) and two blue line prints only. The reproducible print will be returned. All blue line prints 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.
5. Welder's certificates
6. Submit evidence of fabricator and erector qualifications.

C. Shop Drawings prepared under the supervision of, signed and sealed by a Licensed Professional Engineer, 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.
2. Welds: Indicate welds by standard AWS A2.1 and A2.4 symbols. Distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Bolts: Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
4. Setting Drawings: Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorage's to be installed by others.
5. Erection Drawings: Prepare and furnish to the Architect for review, erection drawings, detailed shop drawings and connection design calculations for all structural steel. Manufacturing of any material or performing of any work before final review of shop drawings will be entirely at risk.
6. Contract documents shall not be used for shop drawing, including erection plans or details.
7. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
8. Fabrication, assembly and erection shall conform to reviewed shop drawings.

D. Connection Calculations:

1. All structural steel connections 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 of Alabama.
2. Design calculations for the connections 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 of Alabama. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal.
3. For each connection, the following shall be noted on the shop drawings:
4. Required design reaction.
5. Calculation sheet number for design.
6. Capacity of detailed connection.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project

names and addresses, names and addresses of architects and owners, and other information specified.

F. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

1.4 QUALITY ASSURANCE:

A. Erector Qualifications: Engage an experienced Erector who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

C. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC's "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design."
2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."
3. AISC "Specifications for Structural Steel Buildings, Section 10, Architecturally Exposed Structural Steel."
4. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
5. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
6. AISC's "Seismic Provisions for Structural Steel Buildings."
7. 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 extend 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.
   b. Paragraph 3.1:Add the following: "3.1.8 Include in the bid price for the work structural steel members shown on drawings, but not identified as to size, section, and material grade by assuming sizes, sections, and material grades shown for similarly loaded members having approximately the same overall length except on areas that are noted on the drawings as incomplete. Identify such members and their associated cost in the bid for the work".

c. Paragraph 3.3:Delete the first sentence, “In case of discrepancies between plans and specifications for buildings, the specifications govern”, and insert the following in its place, “In case of discrepancies between drawings and specifications for buildings, the drawings govern”.
d. Paragraph 3.4:In the first sentence, delete the phrase “and made to a scale not less than 1.8” to the foot”.
e. Paragraph 5.1:Delete the first sentence, “When the fabricator receives ‘released for construction’ plans and specifications, the fabricator may immediately place orders for the material necessary for fabrication”. and insert the following in its place “when the fabricator receives ‘issued for structural steel mill order of wide flange beams, girders and columns only’ plans and specifications, the fabricator may immediately place orders for the material necessary for fabrication”. Delete the second sentence, “The contract documents must note any materials or areas which should not be ordered due to a design which is incomplete or subject to revision”.

8. ASTM A 6 (ASTM A 6M) “Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.”
9. Research Council on Structural Connections’ (RCSC) “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”
10. Research Council on Structural Connections’ (RCSC) “Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”

D. Welding Standards: Comply with applicable provisions of AWS D1.1 “Structural Welding Code—Steel.”

E. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification in the past year.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
B. 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.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. 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.

1.6 SEQUENCING:

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

1.7 TESTING SERVICES:

A. Provide the Testing Laboratory with the following:

1. A complete set of shop and erection drawings reviewed by the Architect.
2. Mill test reports, cutting lists, order sheets, material bills and welder's certificates.
3. Full and ample means and assistance for testing all material.
4. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.

B. Propose procedures, acceptable to the Architect, to correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements.

C. Provide additional tests, by the Quality Control Testing Laboratory, as may be necessary, to reconfirm any noncompliance of the original work, and as may be necessary to show compliance off corrected work.

PART 2 – PRODUCTS

2.1 STEEL 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 Shapes, Plates, and Bars: As follows:

1. Carbon Steel: ASTM A 36 (ASTM A 36M).
2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 572 (ASTM A 572M), Grade 50.

C. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

D. Hot-Formed Structural Steel Tubing: ASTM A 501.

E. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Finish: Black, except where indicated to be galvanized.

F. 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.

1. Finish: Black, except where indicated to be galvanized.

G. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

H. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Unheaded Rods: ASTM A 36 (ASTM A 36M).
2. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts.
3. Washers: ASTM A 36 (ASTM A 36M).

I. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain, uncoated.

J. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER:

A. Primer: SSPC-Paint 15, Type I, red oxide.

2.3 GROUT:

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time. Subject to compliance with requirements, provide one of the following:

1. High Performance (Non-Metallic):
   a. “Masterflow 928”; Master Builders.
   b. “Crystex”; L & M Const. Chemical Co.
2. Construction Grade (Non-Metallic):
   a. “Set Grout”; Master Builders.
   b. “Euco-NS Grout”; Euclid Chemical Co.
   c. “Duragrout”; L & M Const. Chemical Co.
   d. “Horn Non-Corrosive Non-Shrink Grout”; A.C. Horn, Inc.
   e. “588 Grout”; W.R. Meadows, Inc.
   f. “Five Stair Grout”; Five Star Products, Inc.

2.4 FABRICATION:

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.

6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
7. Piping and/or cracks in flanges or webs of all rolled shapes or plates are to be removed and welded solid by AISC procedures.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

E. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

F. Welded Door Frames: Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. 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. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

H. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

2.5 SHOP CONNECTIONS:

A. 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.

B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

2.6 SHOP PRIMING:

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing, [unless otherwise specified].
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:

1. SSPC-SP 2 "Hand Tool Cleaning."

2.7 SOURCE QUALITY CONTROL:

A. Independent Testing and Inspecting Laboratory: Owner will engage an Independent Testing and Inspecting Laboratory to perform shop inspections and tests and to prepare test reports.

1. Testing laboratory will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
2. Provide testing laboratory with access to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts".

E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing laboratory's option.

1. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
2. Ultrasonic Inspection:ASTM E 164.

PART 3 –EXECUTION:

3.1 INSPECTION:

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete [and masonry bearing surfaces] and locations of anchorage's for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

3.3 ERECTION:

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
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 plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
   a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. 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.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS:

A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.

B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½ inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

3.5 FIELD QUALITY CONTROL:

A. Testing Laboratory Responsibility: The Owner's Testing Laboratory will perform field special inspections and tests on and to prepare test reports as follows:

1. Testing Laboratory shall also approve welding certificates. Contractor shall submit three (3) copies of welding certificates and procedures for each welder involved in the Work.
2. Testing Laboratory shall conduct and interpret tests, certificates and procedures and state in each report whether tested Work complies with or deviates from requirements.

B. Quantity of Required Inspections and Tests: Testing Laboratory shall perform inspections or tests in accordance with AISC specification:

1. Shop Bolted Connections: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
2. Shop Welded Connections: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
3. Field-Bolted Connections: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
4. Field Welding: Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.
5. Other Inspections as required by AISC and indicated on Special Inspection Schedule in Construction Documents.

C. Provide access for Testing Laboratory to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Deficiencies: Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

E. Field Inspections and Tests: check steel as received in the field for possible shipping damage workmanship, piece making and verification of required camber.

F. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.6 CLEANING

A. 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 a minimum dry film thickness of 1.5 mils (0.038 mm).

B. Touch up Painting: Cleaning and touch up painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Section 09900, "Painting."

END OF STRUCTURAL STEEL

SECTION 05 2100

STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:
   1. K-series open-web steel joists.
   2. Joist accessories.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 01 4100, "Testing and Inspection Services - General": Independent testing agency procedures and administrative requirements.
   2. Section 03 3100," Concrete": Installing anchors set in concrete.
   3. Section 04 2000, "Unit Masonry": Installing anchors set in unit masonry.
   4. Section 05 1200, "Structural Steel": Field quality-control procedures
   5. Section 05 5000, "Metal Fabrications": Loose, steel bearing plates and miscellaneous steel framing.
   6. Section 09 9000, "Painting": Surface preparation and prime painting.

1.2 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Engineer, fabricate, and erect joists and connections to withstand design loads within limits and under conditions required.
   1. Design Loads: As indicated.
   2. Design joists to withstand design loads without deflections greater than the following:
      a. Floor Joists: Vertical deflection of 1/360 of the span.
      b. Roof Joists: Vertical deflection of 1/240 of the span.

B. Engineering Responsibility: Engage a joist manufacturer who utilizes a qualified professional engineer to prepare design calculations, shop drawings, and other structural data for steel joists.

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of joist, accessory, and product specified.

C. Shop Drawings showing layout, mark, number, type, location, and spacing of joists. Include joining and anchorage details, bracing, bridging, accessories, splice and connection details, and attachment to other units of Work.
   1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.
   2. For joists indicated to comply with certain design loadings, include structural analysis

data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Design calculations submit for record one copy of design calculations, sealed by an engineer registered in the state where the project is located, for joist and joist girders with cantilevers or concentrated loads or joist sizes for which standard load tables are not applicable.

E. Material certificates signed by joist manufacturer certifying that joists comply with SJI's "Specifications."

F. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

G. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

I. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence joists' compliance with building code in effect for Project.

1.4 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Engage a firm experienced in manufacturing joists similar to those indicated for this Project and that have a record of successful in-service performance.
   1. Manufacturer must be certified by SJI to manufacture joists conforming to SJI standard specifications and load tables.

B. SJI Design Standard: Comply with recommendations of SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders," applicable to types of joists indicated.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the 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 joists that are similar to those indicated for this Project in material, design, and extent.

E. Inspection: Inspect joists and girders in accordance with SJI "Specifications."

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.6 SEQUENCING:

A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel: Comply with requirements of SJI's "Specifications" for chord and web section material.

B. Steel Bearing Plates: ASTM A 36 (ASTM A 36M).

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
   1. Finish:
      a. Plain, noncoated.

D. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish:
      a. Plain, noncoated.

E. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS:

A. Steel Prime Paint: Manufacturer’s standard.

2.3 STEEL JOISTS:

A. Manufacture joists according to SJI's "Specifications," with steel angle top and bottom chord members, of joist types, end arrangements, and top chord arrangements indicated.

B. Manufacture joists according to SJI's "Specifications," with steel angle top and bottom chord members, and as follows:
   1. Joist Type:
      a. K-series steel joists.
      b. DLH-series steel joists.
   2. End Arrangement:
      a. Underslung.
      b. Underslung with bottom chord extensions.
   3. Top Chord Arrangement:

a. Parallel.

C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

D. Provide holes in chord members where shown for securing other work to steel joists. However, deduct area of holes from the area of chord when calculating strength of member.

E. Extend top chords of joists with SJI Type S top chord extensions where indicated, complying with SJI's "Specifications" and load tables.

F. Extend bearing ends of joists with SJI Type R extended ends where indicated, complying with SJI's "Specifications" and load tables.

G. Camber K-series steel joists according to SJI's "Specifications."

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes when joist slope exceeds 1/4 inch in 12 inches (1:48).

I. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

2.4 JOIST ACCESSORIES:

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
1. Supply additional bridging to ensure stability of structure during construction period.

B. Fabricate steel bearing plates with integral anchorage's as indicated and finish as follows:
1. Finish: Shop prime paint.

C. Steel bearing plates with integral anchorages are specified in Section 05500, "Metal Fabrications."

D. Supply miscellaneous accessories, including splice plates and bolts required by the joist manufacturer to complete the joist installation.

2.5 SHOP PAINTING:

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed as follows:
1. Surface Preparation:
a. Either hand tool cleaning, SSPC-SP 2, or power tool cleaning, SSPC-SP 3.

B. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film thickness of not less than 1 mil (0.025 mm).

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of joists. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's recommendations, and the requirements of this Section.

C. Before installation, splice joists delivered to Project site in more than one piece.

D. Space, adjust, and align joists accurately in location before permanently fastening.

E. Install temporary bracing and bridging, connections, and anchors to ensure joists are stabilized during construction.

F. Anchors: Furnish anchor bolts, steel bearing plates, and other devices to be built into concrete masonry construction.

G. Provide unfinished threaded fasteners for anchor bolts, unless high strength bolts indicated.

H. Field weld joists to supporting steel framework and steel bearing plates. Coordinate welding sequence and procedure with placing of joists.

I. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

J. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.

K. Comply with the Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

L. Comply with the Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

M. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

3.3 FIELD QUALITY CONTROL:

A. Testing Laboratory: A qualified independent testing agency employed and paid by Owner will perform field quality-control testing.
   1. Testing laboratory will report test results promptly and in writing to Contractor and Architect.

B. Testing and verification procedures will be required of high-strength bolted connections and field welds.

C. Bolted connections will be visually inspected.

D. Field welds will be visually inspected.

E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.

F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION:

A. Touch Up Painting: Following installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, accessories, bearing plates, and abutting structural steel.
   1. Clean and prepare surfaces by hand tool cleaning, SSPC-SP 2, or power tool cleaning, SSPC-SP 3.
   2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at the time of Substantial Completion.

END OF STEEL JOISTS

SECTION 05 3100

STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:
   1. Steel roof deck.
   2. Composite steel floor deck.

B. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 03 3100, "Concrete":
   2. Section 05 1200, "Structural Steel": Shop-welded shear connectors.
   3. Section 05 5000, "Metal Fabrications": Framing openings with miscellaneous steel shapes.
   4. Section 05 2100, “Steel Joists”.
   5. Section 07 8150, "Sprayed-On Fireproofing".
   6. Section 09 9000, "Painting":
   a. Touch-up and repair painting of deck.
   b. Touch-up and repair of special deck coatings.

1.2 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Submit all shop drawings on one reproducible print (sepia) and one blue line print only. The reproducible print will be returned. All blue line prints required by the Contractor will be the responsibility of the Contractor and shall be made after reproducible is returned.

C. Product data for each type of deck, accessory, and product specified.
   1. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.

D. Shop drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, cut openings, closure strips, deck openings, special jointing, accessories, and attachments to other construction.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Product test reports from qualified independent testing agencies evidencing compliance with requirements of the following based on comprehensive testing:
   1. Mechanical fasteners.

G. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the Project.

1.3 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 (AISC), "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. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

E. Fire-Test-Response Characteristics: Where indicated, provide steel deck panels identical to those tested as part of an assembly for fire resistance per ASTM E 119 by a testing and inspection agency performing testing and follow-up services, that is acceptable to authorities having jurisdiction.

F. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency.

G. Labeling: Identify steel deck with appropriate markings of applicable testing and inspecting agency.

H. Installation Tolerances: Conform to the installation tolerances specified in Part 3.

1.4 DELIVERY, STORAGE, AND HANDLING:

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.5 COORDINATION:

A. Coordinate installation of sound-absorbing insulation strips in acoustic deck ribs with related units of Work specified in other Sections to ensure that the insulation is protected against damage from effects of the weather and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Roof Deck:
   a. Bowman Metal Deck Armco, Inc.
   b. Epic Metals Corp.
   c. Centria/Robertson.
   d. Vulcraft Div. of Nucor Corp.

e. New Millenium.

2. Composite Metal Floor Deck Units:
   a. Bowman Metal Deck Armco, Inc.
   b. Epic Metals Corp.
   c. Centria/Robertson.
   d. Vulcraft Div. of Nucor Corp.
   e. Wiremold/Walker.
   f. Wheeling Corrugating Co., Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK:

A. Steel Roof Deck (At low and high roof): Fabricate panels without top-flange stiffening grooves conforming to SDI Publication No. 28 "Specifications and Commentary for Steel Roof Deck" and the following:
   1. Galvanized-Steel Sheet: ASTM A 446, Grade A, G 60 (ASTM A 446M, Grade A, Z 180) zinc coated according to ASTM A 525 (ASTM A 525M).
   2. Deck Profile:
      a. Type WR, wide rib. Vented deck at light gauge roof trusses.
   3. Profile Depth:
      a. 1-1/2 inches.
   4. Design Uncoated-Steel Thickness:
      a. 0.0295 inch.
   5. Span Condition:
      a. Triple span or more.
   6. Side Joints:
      a. Overlapped or interlocking seam at Contractor's option.

2.3 FLOOR DECK:

A. Composite Steel Floor Deck: Fabricate panels with integrally embossed or raised pattern ribs and interlocking side laps, conforming to SDI Publication No. 28 "Specifications and Commentary for Composite Steel Floor Deck," the minimum section properties indicated, and the following:
   1. Galvanized-Steel Sheet: ASTM A 446, Grade A, G 90 (ASTM A 446M, Grade A, Z 275) zinc coated according to ASTM A 525 (ASTM A 525M).
   2. Profile Depth:
      a. 3 inches.
   3. Design Uncoated-Steel Thickness:
      a. 0.0474 inch.
   4. Span Condition:
      a. Triple span or more.

2.4 FABRICATION AND ACCESSORIES:

A. General: Form deck units in lengths of three or more spans, with flush, telescoped, or nested 2-inch laps at ends and interlocking or nested side laps, unless noted. End laps shall occur over a support.

B. Roof Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck".

C. Cant Strips: Fabricate cant strips of not less than 20 gage galvanized sheet steel of same quality as the deck units. Bend cant strips to form a 45 degree cant not less than 5 inches wide with top and bottom flanges not less than 2 inches wide, unless noted. Provide cant strips in 10 foot lengths where possible.

D. Ridge and Valley Plates: Fabricate ridge and valley plates of not less than 20 gage galvanized sheet steel of the same quality as deck units. Bend to provide tight-fitting closure with deck units. Each leg of bend shall not be less than 3 inches. Provide plates in 10 foot lengths where possible.

E. Accessories: Provide accessory materials for steel deck that comply with requirements indicated and recommendations of the steel deck manufacturer.

F. Mechanical Fasteners: Manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.

G. Side Lap Fasteners: Manufacturer's standard, corrosion-resistant, hexagonal washer head; self-drilling, carbon steel screws, No. 10 (4.8 mm) minimum diameter.

H. Rib Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

I. Miscellaneous Roof Deck Accessories: Steel sheet, 0.0359-inch (0.91-mm) thick minimum ridge and valley plates, finish strips, and reinforcing channels, of same material as roof deck.

J. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material and thickness as deck panels, unless otherwise indicated.

K. Weld Washers: Manufacturer's standard uncoated-steel sheet weld washers, shaped to fit deck rib, 0.0598 inch (1.5 mm) thick with 3/8-inch (9.5-mm) minimum diameter prepunched hole.

L. Recessed Sump Pans: Manufacturer's standard size, single piece steel sheet 0.071-inch- (1.8-mm-) thick minimum, of same material as deck panels, with 1-1/2-inch- (38-mm-) minimum deep level recessed pans and 3-inch- (76-mm-) wide flanges. Cut holes for drains in the field.

M. Flat Receiver Pan: Manufacturer's standard size, single-piece steel sheet, 0.071-inch- (1.8-mm-) thick minimum units, of same material as deck panels. Cut holes for drains in the field.

N. Shear Connectors: ASTM A 108, Grade 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B.

O. Steel Sheet Accessories: ASTM A 446, G 60 (ASTM A 446M, Z 180) coating class, galvanized according to ASTM A 525 (ASTM A 525M).

P. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine supporting framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of steel deck.

3.2 PREPARATION:

A. Do not place deck panels on concrete supporting structure until concrete has cured and is dry.

B. Locate decking bundles to prevent overloading of supporting members.

3.3 INSTALLATION, GENERAL:

A. Install deck panels and accessories according to applicable specifications and commentary of SDI Publication No. 28, manufacturer's recommendations, and requirements of this Section.

B. Install temporary shoring before placing deck panels when required to meet deflection limitations.

C. Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting framing before being permanently fastened. Do not stretch or contract side lap interlocks.

1. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
2. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
3. Do not use deck units for storage or working platforms until permanently secured.
4. Place deck panels flat and square and fasten to supporting framing without warp or deflection.
5. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to the decking.
6. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
7. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
8. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's instructions.

D. Deck Edge Tolerances: Perimeter deck edges shall be within =/- 1/2 inch of the indicated lines.

3.4 ROOF DECK INSTALLATION:

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as follows:

1. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
2. Weld Diameter:
   a. 5/8 inch (16 mm), nominal.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.
5. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 36 inches (910 mm), using one of the following methods:
   a. Mechanically fasten with self-drilling No. 10- (4.8-mm-) diameter or larger carbon steel screws.

B. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints:
   a. Lapped 2 inches (51 mm) minimum.

C. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 psf at eave overhang and 30 psf for other roof areas.

D. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for

strength, continuity of decking, and support of other work shown.

E. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking, and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.

F. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's recommendations. Weld to substrate to provide a complete deck installation.

3.5 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 (16 mm), nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
3. Weld Washers: Install weld washers at each weld location.
4. Side Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, or at intervals not exceeding 36 inches (910 mm), using one of the following methods:
    a. Mechanically fasten with self-drilling No. 10- (4.8-mm-) diameter or larger carbon steel screws.

B. Shear Connectors: Weld shear connectors through deck to support framing according to AWS D1.1 and manufacturer's instructions. Butt end joints of deck panels; do not overlap.

C. End Bearing: Install deck ends over supporting framing with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints:
    a. Lapped.

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 decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

3.6 FIELD QUALITY CONTROL:

A. Testing Agency: A qualified independent testing agency employed and paid by Owner will perform field quality-control testing.

1. Field welds will be subject to inspection.

B. Testing Agency will report test results promptly and in writing to Contractor and Architect.

C. Remove and replace work that does not comply with specified requirements.

D. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.7 REPAIRS AND PROTECTION:

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.

END OF STEEL DECK

SECTION 05 3200
ACOUSTIC ROOF DECK / CEILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Acoustical steel deck/ceiling system.
      a. The steel deck shall serve as an acoustical ceiling and a structural roof deck as indicated on the drawings.

B. The acoustical deck and ceiling system shall provide an exposed bottom surface that is substantially flat. The narrow rib openings of the acoustical deck and ceiling system shall provide the appearance of a linear ceiling. Fasteners for sidelaps and overlying roofing materials shall be concealed within the depth of the dovetail shaped ribs.

C. Wedge Nut hanging devices (supplied with Wedge Locks) that are specially configured to fit into the dovetail shaped ribs of the acoustical roof deck and ceiling system shall be available. These hanging devices shall be utilized whenever any related work is suspended from the acoustical roof deck and ceiling system. Wedge Nut hanging devices shall be furnished by the installer of the related work unless otherwise indicated.

D. The Requirements of this Specification Section include all materials, equipment, and labor necessary to furnish and install acoustic deck/ceiling system.

E. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

F. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 05 1200, "Structural Steel":
   2. Section 00 5500, "Metal Fabrications": Framing openings with miscellaneous steel shapes.
   3. Section 09 9000, "Painting":
      a. Touch-up and repair painting of deck.
      b. Touch-up and repair of special deck coatings.

1.2 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer’s specifications, section properties, load tables, diaphragm shear tables, dimensions, finishes, fire resistance ratings, UL fire test reports, and noise reduction coefficients sealed by Professional Engineer licensed in the State of Alabama.

C. Shop Drawings: Submit unit placement drawings showing profiles, material thickness, finishes, layout, anchorage and openings sealed by Professional Engineer licensed in the State of Alabama.

D. Samples: Submit full width sample if requested to verify compliance with the specifications and the level of quality.

E. Product test reports from qualified independent testing agencies evidencing compliance with requirements of the following based on comprehensive testing:
   1. Mechanical fasteners.
   2. Acoustic roof deck.

F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence steel deck's compliance with the building code in effect for the Project.

1.3 QUALITY ASSURANCE

A. Deck manufacturer shall have been regularly engaged in the production of dovetail rib profiles for a period of at least ten years.

B. 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’’.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification. Qualify welding processes and welding operators in accordance with “Welder Qualification” procedures of AWS D1.1.

D. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in “Factory Mutual Approval Guide” for Class 1 fire rated construction, and Class I-90 windstorm ratings.

E. U.L. Listing: Provide roof anchoring system to comply with Underwriters Laboratories requirements for U.L. Class 90 wind uplift rating.

F. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

G. Acoustic Deck units shall be cold-formed by the continuous roll-forming process to assure quality and uniformity of profile.

H. Section Properties: Shall be computed in accordance with the American Iron and Steel Institute (AISI) Specification for Design of Cold Formed Steel Structural Members.

I. Materials: Shall be in accordance with A.S.T.M., American Society for Testing and Materials.

J. Welding: Shall comply with applicable provisions of the American Welding Society (AWS) D1.3 Structural Welding Code - Sheet Steel.

K. Superimposed Load and Diaphragm Shear Capacities: Loads and capacities shall be computed in accordance with the requirements of the Steel Deck Institute (SDI).

L. Noise Reduction coefficients: : Shall be verified by the results of sound absorption tests conducted at Riverbank Acoustical Laboratories, in accordance with the ASTM standard test method for sound absorption and sound absorption coefficients by the reverberation room method: ASTM C423 and E795.

M. Deck installer shall have installed products similar in material, design and extent to that specified for this project and whose work has resulted in construction with a record of successful in-service performance for a period of at least 5 years.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deck units shall be protected from damage during delivery, storage and handling.

B. If storage at the jobsite is required, deck units shall be elevated above the ground, sloped to provide drainage and protected from weather with a ventilated covering.

C. Replace all insulation which gets wet or damaged during transit, temporary storage, installation or otherwise.

1.5 COORDINATION

A. Coordinate length of fasteners for roofing and thermal insulation to avoid penetrating the lower finished surface of the deck units.
   1. Fasteners for sidelaps and overlying roof materials shall be concealed within the depth of the dovetail-shaped ribs.

B. Coordinate field cleaning and painting to assure adhesion to shop coatings.

C. Coordinate installation of acoustic insulation and stand-off mesh in the acoustic roof deck with the roofing contractor prior to installing roofing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acoustical Dovetail Steel Roof Deck:
      a. Epic Metals Corp. or equal.

2.2 MATERIALS

A. Deck units shall be cold-formed from steel coils conforming to ASTM A653, Structural Quality, Grade 40 with a minimum yield strength of 40 ksi.
B. Before forming, the steel coils shall have received a hot-dip protective coating of zinc conforming to ASTM A924, Class G60 or G90 as defined in ASTM A653.
C. Deck Profile Depth: 4”
D. Design Uncoated Steel Thickness: 0.0474”
E. The minimum uncoated thickness of materials furnished shall not be less than 95% of the design thickness.

2.3 FABRICATION

A. The deck units shall be cold-formed by the continuous roll forming process.
   1. The acoustical deck and ceiling system panels shall have continuous dovetail shaped ribs. The deck shall be minimum 4” deep.
   2. The deck units shall have full depth positive registering sidelaps that can be fastened by welds or screws.
   3. The Acoustic Deck units shall be prime painted white at the factory. Before painting, the galvanized steel shall be chemically cleaned, pretreated and coated with a .2 mil epoxy primer, oven cured then followed by a second coat of a .5 mil polyester prime paint and then oven cured. Compatibility of field applied finish paint with factory applied prime paint shall be the responsibility of the painting contractor. Prime paint shall be white. The roof deck shall be prime painted on both the top and bottom surfaces.
   4. Whenever possible, deck units shall be fabricated to provide a multiple span condition.
   5. The acoustical deck and ceiling system panels shall be fabricated with perforations. The perforated areas shall be located in the bottom flat areas between the dovetail shaped ribs. Acoustic roof deck shall have a minimum NRC value of .95. This value shall be established by sound absorption tests without the use of fiberglass insulation above the panels. The combination of these sections shall form panels that contain cavities suitable for location of factory installed sound absorbing elements.

2.4 ACCESSORIES

A. Standard hanging devices shall be available from the deck manufacturer.
   1. These devices shall be installable and relocatable anywhere along the length of the interior ribs. Consult manufacturer’s product data for minimum spacing, load capacities and proper installation procedures.
B. Manufacturer’s standard ridge plates, valley plates, transition plates and closures shall be provided. Provide all clips, anchors, materials, reinforcements, supplemental framing and accessories, etc., as required for a complete, watertight and proper installation in compliance with requirements.
C. Openings and reinforcement for openings noted specifically “by the deck manufacturer” on the structural drawings shall be provided.
D. Acoustic elements shall be provided for installation above the perforations in the bottom flat area between the dovetail shaped ribs. To facilitate field painting of the perforated surfaces, the sound absorbing elements shall be supported above the surface by spacers. Sound absorbing elements and spacers shall be furnished under this specification section. These acoustic elements are field installed by the roofing contractor in the acoustic roof deck.
E. Air dams shall be provided by the deck manufacturer where indicated on the drawings where the deck transitions from interior to exterior space.

PART 3 - EXECUTION

3.1 GENERAL

A. The Acoustic Deck System shall be installed in strict accordance with the manufacturer’s instructions, approved erection drawings and all applicable safety regulations. Coordinate length of fasteners for roofing and thermal insulation to avoid penetrating the lower surface of the deck / ceiling.

3.2 EXAMINATION

A. The supporting frame or other related work shall be inspected and accepted by the erector of the Acoustic Roof Deck system before start of installation.

3.3 PREPARATION

A. Bundles of material shall be located on the supporting frame in such a manner that overloading of any of the individual-framing members does not occur.

3.4 INSTALLATION

A. The Acoustic Deck units and related accessories shall be installed in accordance with manufacturers approved erection drawings, SDI Publication No. 29, SDI Manual of Construction with Steel Deck and all federal and state safety regulations.

B. Before being permanently fastened deck units shall be placed on the supporting frame and adjusted to final position with ends accurately aligned and adequately bearing on the supporting frame. Consistent coverage shall be maintained so that panels located in adjacent bays will be properly aligned. Care should be taken to maintain uniform spacing of bottom rib openings at the sidelaps.

C. Cutting of deck units to suit jobsite conditions shall be performed in a neat and workmanlike manner. Only those openings indicated on the structural drawings shall be cut. Other openings shall be cut and reinforced by those requiring the opening as approved by the structural engineer.

D. The acoustical panels shall be fastened to all supporting members with 3/4" diameter puddle welds at a nominal spacing of 12" on center or less or as indicated on the manufacturer's erection drawings.

1. The sides of the acoustical panels located at the perimeter of the building shall be fastened to supporting members with 3/4" diameter puddle welds at a maximum spacing of 36" on center or less as indicated on the manufacturer's erection drawings.

E. The sidelaps of the acoustical panels shall be fastened together with 1 1/2" long fillet welds or #12 screws as indicated on the manufacturer's erection drawings.

F. Construction loads shall not be applied to deck units until after the units are permanently fastened to supporting members and sidelaps have been attached and shall not exceed the load carrying capacity of the units.

G. Items such as ceilings, light fixtures, conduit, pipe and ductwork shall not be suspended from Acoustic Roof Deck units without specific approval of the structural engineer.

H. Sump pans, ridge plates, valley plates, transition plates, eave plates, and supplied reinforcement for small openings shall be fastened as indicated on the manufacturer's erection drawings.

3.5 FIELD QUALITY CONTROL:

A. Quantity of Required Inspections and Tests: Testing Laboratory shall perform inspections or tests in accordance with AISC specification:

1. Field welds and screwed deck attachment will be subject to Special Inspection requirements per 2012 IBC. Refer to Special Inspection Schedule in Construction Documents.

B. Testing Agency will report test results promptly and in writing to Contractor and Architect.

C. Remove and replace work that does not comply with specified requirements.

D. Additional testing will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION:

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Touch-up Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on both surfaces of installed deck panels.

1. Touch up painted surfaces with same type of shop paint used on adjacent surfaces.
2. Where shop-painted surfaces are exposed in-service, apply touch-up paint to blend into adjacent surfaces.

END OF ACOUSTIC ROOF DECK / CEILING

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

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 04 2000 - Unit Masonry: Veneer masonry supported by wall stud metal framing.

C. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

D. Section 07 2100 - Thermal Insulation: Insulation within framing members.

E. Section 07 9010 - Joint Sealers.

F. Section 09 2116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

G. Section 09 5100 - Acoustical Ceilings: Ceiling suspension system.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SYSTEM DESCRIPTION

A. Horizontal Deflection: Design to permit maximum deflection of 1/600 of span at locations with brick or stucco veneer, and 1/360 at all other locations.

B. Vertical Deflection: Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.

C. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

D. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

E. Work described in this Section includes galvanized steel stud framing systems for use at any new exterior metal stud walls and framing, interior load-bearing walls, and other locations as indicated on drawings.

1. Studs and runner tracks at exterior walls and interior load-bearing walls (if any) shall be 6-inches depth x 1-5/8-inches width, and spaced at sixteen inches (16") o.c., unless otherwise indicated, with continuous bridging channels and/or stud tracks as bridging channels, as indicated, and framed structural headers at all openings.

2. Joists and rafters (if any) and their stringers (at ends over bearing locations), bridging, and web stiffeners shall be as indicated herein, unless indicated otherwise on the Drawings; joists shall be spaced sixteen (16) inches o.c., directly over bearing studs or immediately adjacent to studs where anchored to sides of stud walls, unless otherwise indicated or accepted in writing by Architect.
3. Typical stud and joist sections shall be C-shape, and at least 1-5/8-inches width.
4. Galvanized steel strap bracing shall be provided, continuous at top and bottom runner tracks and at bridging locations at all curved stud walls.
5. Structural channels, studs, and joists, and other framing shall be as indicated on the Structural Drawings.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: For lateral-force resisting systems, provide product data sheets on hold-down, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
1. Indicate stud and ceiling joist layout.
2. Describe method for securing studs to tracks and for bolted or welded framing connections.

E. Steel Framing Industry Association (SFIA) Certification:
1. Design Data: As required by the structural drawings.
a. Shop drawings signed and sealed by a professional structural engineer.
2. Design calculations sufficient to demonstrate compliance with design criteria; signed and sealed by a professional structural engineer.
3. Details and calculations for factory-made connectors, signed and sealed by a professional structural engineer.

F. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

G. Installation Drawings: Indicate dimensioned locations of cold-formed steel structural framing.

H. Shop drawings shall bear the current State seal and license number of the manufacturer's and/or fabricator's Design Engineer.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.

B. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

E. Design structural elements 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.

1.08 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Include Cold-Formed Metal Framing in mock-up as described in Section 01 4000 - Quality Requirements.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on shop drawings.

B. Coordinate work of this section with the placement of components within the stud framing system as specified in Section 09 2116 - Gypsum Board Assemblies.

1.10 DELIVERY, STORAGE AND HANDLING

A. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with breathable waterproof tarpaulins.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Structural Framing:
   1. Aegis Metal Framing, LLC.
   2. ClarkDietrich Building Systems LLC: www.clarkdietrich.com.
   3. MBA Metal Framing: www.mbastuds.com.
   4. Marino/WARE Industries, Corp.
   5. SEMCO, Southeastern Metals, Div. of Gibraltar Industries.
   6. Southeastern Stud & Components, Inc.: www.sestud.com.
   7. Steel-Con; Div. of Steel Construction Systems: www.steelconsystems.com.
   8. Telling Industries, LLC: www.tellingindustries.com.
   9. U.S. Gypsum Co

B. Connectors:
   1. Same manufacturer as metal framing.

2.02 PERFORMANCE REQUIREMENTS

A. Cold-Formed Metal Eave and Fascia System: Structural vented eave and fascia system. Galvanized steel, ASTM A 653, G-90, Grade 40, structural quality. Kynar 500 finish.
   1. Manufacturer/Product:
      a. Precision Fabricators: 404-965-9341.
      b. Architectural Products Co.: 800-837-1001.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Design Requirements: Design cold-formed framing systems, components and connectors to withstand specified design loads in compliance with ICC (IBC), ASCE 7, AISI S100, and AISI S240.

2.03 STRUCTURAL FRAMING COMPONENTS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

B. System Components: With each type of metal framing and headers required, provide manufacturer's standard steel runners (tracks), blocking, bridging, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.

C. Materials and Finishes:
   1. For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi; ASTM A 446, A 570, or A 611.
   2. For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.
   3. Provide galvanized finish to metal framing components complying with ASTM A 653 for minimum G60 coating.
      a. Finish of installation accessories to match that of main framing components, unless otherwise indicated.

D. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.
   1. Studs: Manufacturer's standard load-bearing steel studs of size, shape, and gauge indicated, with 1.625-inch flange and flange return lip; or if not indicated, no less than 16-gauge.
   2. Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, unpunched unless otherwise indicated, of size, shape and gauge

indicated, with 1-5/16-inch flange.

a. Deflection Track - Typical at Stud Walls Up To Slab or Similar Fixed Structure at Top of Walls: Provide for no less than 1" of vertical movement. Equivalent to one of the following:
   1) Dietrich Double Track System.
   2) Dietrich Track-Over-Track System.
   3) Dietrich SLP-TRK slotted track system.
   4) Dietrich TR-Series with Spazzer 9200 Bar (SPZD).

b. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK: www.flexabilityconcepts.com.

c. Special stud tracks for all arched openings and walls shall be equivalent to "Flex-C Arch" galvanized flexible segmented track with slidable straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK: www.flexabilityconcepts.com.

3. Gage and depth: As required to meet specified performance levels.
4. Galvanized in accordance with ASTM A653/A653M, G90/Z275 coating.

2.04 ACCESSORIES

A. Stud Wall Bridging: 1-1/2-inches x 16-gage Cold Rolled Channel, unless otherwise indicated, anchored to each stud with 16-gage clip angles, or welded connections (where allowed by manufacturer), and 16-gage splice plates, with spacing at 4'-0" or 4'-6" o.c. vertically, through pre-punched slots in studs.

B. Solid Joist Bridging: 1-5/8-inches x same gauge and depth as joists, unless otherwise indicated, anchored to joists webs with 2-inch x 2-inch x 16-gauge clip angles, or welded (where allowed by manufacturer) with continuous rows spaced at mid-span minimum, or 5'-0" o.c. maximum at clear span where span exceeds 10'-0".

C. Strap Bracing: 1-1/2-inches x 20-gage galvanized steel, anchored at ends, splices, and each stud with typical framing screws. Placement at curved walls shall align with radius or curve indicated at each such location.

D. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

E. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.05 FASTENERS

A. Anchorage Devices for concrete: Power actuated and Screws with sleeves.

B. Electrodes for Welding: Comply with AWS Code.

2.06 FABRICATION

A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.

B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.

C. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer. Wire tying of framing components is not permitted.
   1. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

D. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8-inch in 10 feet, and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8-inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8-inch (3 mm).

E. Headers: Form from at least two equal size C-shapes in a back-to-back or box type configuration.

2.07 SHOP FABRICATED ASSEMBLIES

A. Shop fabricate metal framing to the greatest extent possible.

B. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION - GENERAL

A. Manufacturer's Instructions: Install metal framing system in accordance with manufacturer's current printed or written instructions and recommendations, unless otherwise indicated.

B. Runner Tracks:
1. Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks at all walls anchored to concrete floor and roof structure with threaded studs in expansion shields spaced 18-inches o.c., unless otherwise indicated.
2. Track shall be spliced with channel insert fastened with two (2) sheet metal screws, bolts or rivets at each side, each flange, each corner. Provide fasteners at corners and ends of tracks.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners and bridging to supporting structure.

E. Install supplemental framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

F. Erection Tolerances: Bolt or weld panels (at both horizontal and vertical junctures) to produce flush, even, true to line joints.
1. Step in face and jog in alignment between panels not to exceed 1/16-inch.

3.03 INSTALLATION OF STUDS

A. Install wall studs plumb and level.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners or by welding at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center maximum; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

D. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than two (2) are either shown or indicated in manufacturer's written instructions. Install cripple studs below and king studs and jack studs on each side/end of headers, minimum same size and gauge as wall studs where occurs, and anchor together securely. Install runner tracks and jack studs above and below headers at wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated. Attach structural sheathing to each component.

E. Install horizontal bridging in all walls, and the additional strap bracing at curved walls as steel framing progresses. Install at spacing indicated and in compliance with stud manufacturer's written recommendations.

F. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system

G. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

H. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.

I. Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.

J. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

K. Install intermediate studs above and below openings to align with wall stud spacing.

L. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.

M. Attach cross studs to studs for attachment of fixtures anchored to walls.

N. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

O. Touch-up field welds and damaged corrosion protected surfaces with primer.

3.04 FIELD QUALITY CONTROL

A. Testing: All field quality-control testing shall be performed by a qualified independent testing agency. Refer to Section 01 4000 - "Quality Requirements" for additional information and requirements.
   1. Field and shop welds will be subject to inspection and testing.
   2. Testing agency will report test results promptly and in writing to Contractor and Architect.
   3. Remove and replace Work that does not comply with specified requirements.
   4. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.05 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 cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

3.06 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Variation of any Member from Plane: 1/16 inch.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

B. Downspout boots.

C. Ladders.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 5100 - Metal Stairs.

E. Section 05 5213 - Pipe and Tube Railings.

F. Section 07 7123 - Manufactured Gutters and Downspouts: Downspouts to which downspout boots are to be attached.

G. Section 05 7200 - Ornamental Handrails and Railings.

H. Section 07 7200 - Roof Accessories: Roof Hatch.

I. Section 09 9100 - Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2024.

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 A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

I. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.

J. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.

K. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.

L. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

M. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric

Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

Q. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

S. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

T. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 DESCRIPTION OF WORK

A. Work described in this section includes metal fabrications, which include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere. Types of work in this section includes metal fabrications for:
1. Rough hardware.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Miscellaneous framing and supports.
5. Ladders.
6. Guard posts (bollards), with concrete fill and matching metal domed cap welded on post.
7. Downspout boots.
8. Anchor plates, channels and/or angles with anchor bolts; galvanized.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Samples: Submit representative samples of materials and finished products as may be requested by Architect.

1.06 QUALITY ASSURANCE

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Where fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting acceptable to fabricator's professional engineer, and in a manner that will not affect structural performance, deflection, safety, etc.

1.08 COORDINATION

A. Coordinate installation of anchorages for metal fabrications and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation, without delaying the work of this section or the Work of the project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled

trade names and roughness.

2.02 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Stainless Steel: Type 304.

D. Plates: ASTM A283/A283M.

E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

G. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.

H. Galvanized Structural Sheet Steel: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

I. Steel Pipe: ASTM A 53; Type and grade (If applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.

J. Gray Iron Castings: ASTM A 48, Class 30.

K. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

L. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

M. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153

N. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

O. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

P. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 6063 alloy, T6 temper.

C. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

D. Aluminum-Alloy Die Castings: ASTM B85/B85M.

2.04 MATERIALS - ACCESSORIES

A. Grout: Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE-CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Fasteners:
   1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

C. Paint:
   1. Metal Primer Paint: Southern Coating "Heavy Duty RIP Primer 1-0900", Tnemec "10-99 Primer", or approved equivalent.
   2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09 9000 - PAINTING.
   3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with Military Specifications MIL-P-21035 (Ships), or SSPC-Paint-20.
   4. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187 for all fabrications in

contact with concrete or masonry.

2.05 FABRICATION

A. Field verify ladder dimensions prior to fabrication.

B. Fit and shop assemble items in largest practical sections, for delivery to site.

C. Fabricate items with joints tightly fitted and secured.

D. Continuously seal joined members by continuous welds.

E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

F. Exposed Mechanical Fastenings (if any): Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

G. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.06 FABRICATED ITEMS

A. Hatch Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

B. Roof Access Ladder:
   1. Manufacturer:
      a. ACL Industries, Inc., (603) 668-1276: www.aclindustries.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Product: Aluminum Fixed Access Ladder.
      a. Material: Aluminum.
      b. Fabrication: All-welded; High-strength aluminum components; Deep Serrated Rungs - 1000 lb. loading; Meets OSHA/ANSI A14.3 Standards.
      c. Finish: Powder-Coated: Color - As Selected.
      d. Heavy Duty, with Platform, and Return to Rear Parapet.
      e. Model: ACL-203.

C. Bollards: Steel pipe, concrete filled, crowned metal cap, as detailed; galvanized finish.

D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; galvanized finish.

E. Lintels: As detailed; galvanized finish.

F. Stainless Steel Wall Panels: Wall panels for wall protection, where indicated. Provide panel system, including panels, outside corners, inside corners, corner guards and fastening devices.
   1. Panels: Size: Custom, 4'x8' maximum. Panel thickness: 18 gauge. For adhering with heavy duty adhesive.
   2. Outside and inside corners: 16 gauge, with 2" legs. For adhesive mount or screw mount.

G. Stainless Steel fabrication where indicated: #4 Satin Finish, 22 gauge, unless indicated otherwise.

H. Miscellaneous framing and supports:
   1. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
   2. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
   3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise shown, space anchors 24-

inches o.c. and provide minimum anchor units of 1-1/4-inches wide x 1/4-inch x 8-inch long steel straps.

4. Galvanize exterior miscellaneous frames and supports

I. Rough hardware:
   1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in DIVISION 6 sections.
   2. Fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.07 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for exterior finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Surface Preparation:
   1. Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specification and environmental exposure conditions of installed metal fabrications:
   2. Exterior (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
   3. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."

E. Prime Painting: One coat.

F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.

G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

H. Lintels: Paint after galvanizing. Paint to match HM door frames.

I. Bollards: Paint after installation.

J. ASTM A 386 for galvanizing assembled steel products.

K. Stainless Steel: #4 finish, unless indicated otherwise.

2.08 FINISHES - ALUMINUM

A. Mill finished aluminum.

2.09 FABRICATION GENERAL

A. Workmanship:
   1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
   2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
   3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
   4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown, or if not shown, Phillips flat-head (countersunk) screws or bolts.
   5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
7. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

B. Alternating Stairs: Carbon Steel: Gas metal arc welded with treads spot welded to stringers and bolt-on handrails with included bolts using the specified materials.

2.10 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 - EXECUTION

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 and aluminum where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

D. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete insets, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

E. Coordinate provision of access ladder with provision of roof hatch to ensure height and position of ladder is compatible with roof hatch curb.

F. Coordinate ladder installation with construction of walls to insure walls are adequately reinforced, cells grouted, blocked, and supported for attachment of brackets and support of ladder.

G. Insulate dissimilar metals to prevent electrolysis with bituminous paint or non-absorptive isloation pad to prevent contact.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Install manufactured items in accordance with manufacturer's directions. Comply with governing regulations, and industry standards applicable to the work.
1. Use fasteners of type and size recommended by manufacturer.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Coordinate ladder installation with construction of walls to ensure adequate support and blocking for attachment of brackets and support of ladder.

E. Ensure ladder is vertical, plumb, aligned with center of roof hatch, and rigid.

F. Field weld components as indicated on drawings.

G. Perform field welding in accordance with AWS D1.1/D1.1M.

H. Obtain approval prior to site cutting or making adjustments not scheduled.

I. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

J. Install security door assembly of ladder and adjust for smooth operation.

K. Safety post extension: Attach to top 2 rungs of ladder and centered between side rails.Adjust post to extend 42 inches above top tail when roof hatch is open and post is fully extended.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 05 5100
METAL STAIRS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with metal treads.

C. Structural steel stair framing and supports.

D. Handrails and guards associated with metal stairs.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 03 3000 - Concrete: Concrete fill in stair pans and landings. Placement of metal anchors in concrete, and miscellaneous footings or slab thickening for stair columns.

C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 1200 - Structural Steel.

E. Section 05 5000 - Me talF: Metal angles, and metal panel infill material.

F. Section 05 5213 - Pi pean: Standard pipe and tube railings and balusters not specified with metal stairs.

G. Section 05 7200 - Ornamental Handrails and Railings. Railing system other than standard pipe and tube railings.

H. Section 09 6500 - Resilient Flooring: Treads for stairs.

I. Section 09 9100 - Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2023.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

Q. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the state in which the project is located, or personnel under direct supervision of such an engineer.

PART 2 - PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
   2. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

E. Stair supplier shall provide and coordinate all means of attachments of stairs to walls, floors and ceilings.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: As detailed. Same material and thickness as tread pans.

C. Treads: field-installed concrete fill
   1. Metal pan with field-installed concrete fill.
      a. Concrete Depth: 1-1/2 inches, minimum.
      b. Concrete Strength: 3,000 psi at 28 days, minimum.
      c. Air Content: 4 to 6 percent.
      d. Concrete Reinforcement: 1/4" rebar, unless Drawings show otherwise.
      e. Cement Color: As selected by Architect.
      f. Aggregate Color: As selected by Architect.
   2. Tread Support: Sized to adequately support treads and live loads; welded or bolted to stringers.
   3. Tread Pan Material: Steel sheet.
   4. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
   5. Pan Anchorage to Stringers: Welded to carrier angles welded to stringers.
   6. Concrete Reinforcement: 1/4" rebar, unless Drawings show otherwise.

D. Risers: Same material and thickness as tread pans.

E. Stringers: As detailed on drawings.
   1. Stringer Depth: As indicated on drawings.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings unless indicated otherwise.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair: Exposed-to-view; to be finished same as specified for other exposed-to-view surfaces.

2.03 METAL STAIRS WITH METAL TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: As detailed on drawings.

C. Treads: Steel plate with abrasive coating.
   1. Tread Thickness: 1/4 inch, minimum.
   2. Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.

D. Stringers: Rolled steel channels.
   1. Stringer Depth: 11 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

E. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

F. Railings: Steel pipe railings unless indicated otherwise.

G. Finish: Galvanized after fabrication, except sheet components are to be galvanized before fabrication.

H. Footings of exterior stairs shall be designed by stair manufacturer.

2.04 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Steel fabrications, as detailed.

B. Guards:
   1. Top Rails: Steel fabrications, as detailed.
   2. Bottom Rails: Steel fabrications as detailed.

3. Infill: As indicated.
4. End and Intermediate Posts: Same material and size as top rails, unless detailed otherwise.
   a. Horizontal Spacing: As indicated on drawings.
   b. Mounting: Welded to top surface of stringer, unless detailed otherwise.

2.05 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, galvanized finish. (For locations exposed to exterior.)

D. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

E. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, transparent finish on steel, unless shown to be otherwise.

F. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

G. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

H. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

2.06 ACCESSORIES

A. Factory Fabricated Stair Tread and Nosing:
   1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
      a. Tread Abrasive Filler: Virgin grain aluminum oxide and/or silicon carbide epoxy-bonded to tread base.
      b. Tread Type: Ribbed bar.
      c. Nosing Types: Long nose for steel pan stairs.
      d. Color: Black.
   2. Manufacturers:
      a. Nystrom, Inc: www.nystrom.com/sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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 A 123/A 123M. (For locations exposed to exterior.)
   1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

2.08 FINISHES

A. Interior Stairs: Shop primed, for Paint Finish.
   1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.

B. Exterior Stairs: Shop galvanized, for Paint Finish:
   1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.

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. Install manufactured items in accordance with manufacturer's directions. Comply with governing regulations, and industry standards applicable to the work.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete or surfaces noted to remain transparent finish on steel.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

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SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall-mounted railings.

B. Handrailings not specified with stairs.

C. Free-standing railings at ramps, steps, or as noted.

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 01 2300 - Alternates.

C. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

D. Section 04 2000 - Unit Masonry: Placement of anchors in masonry.

E. Section 05 5000 - Metal Fabrications: Metal angles, and metal panel infill material.

F. Section 05 5100 - Metal Stairs: Handrails specified with metal stairs.

G. Section 05 7200 - Ornamental Railings: Railing system other than standard pipe and tube railings.

H. Section 09 9100 - Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

F. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

G. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012.

H. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.

I. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2022.

J. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.

K. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications; 2021.

L. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

N. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product specifications and installation instructions for products and processes used in handrails and railings, including finishes and grout.

C. Shop Drawings shall indicate loading requirements as specified herein and be certified, sealed, and signed by a Registered Structural Engineer in the State in which the Project is located, to be in conformance with all requirements as specified herein and in accordance with all State and local codes and regulations.
   1. Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   3. Include the design engineer's stamp or seal on each sheet of shop drawings.

D. Samples: Submit samples for each type of metal finish indicated. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, provide "range" samples showing limits of such variations.
   1. Include samples of fittings and brackets proposed for use.
   2. Include sample of typical welded connection.

E. Samples: Submit two, 12 inch long samples of each type of handrail. Submit two samples of elbow, Tee, wall bracket, escutcheon, and end stop.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in , or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store handrails and railing systems in clean, dry location away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof tarpaulin or polyethylene sheeting; allow for air circulation inside the covering.

B. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and minimum requirements regarding stored materials.

PART 2 - PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and conections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.
   1. Top Rail or Guard Rail: Design to be capable of withstanding the following loads:
      a. Concentrated load of 200 pounds applied at any point non-concurrently, vertically downward, or horizontally.
      b. Uniform load of 50 pounds per lineal foot applied non-concurrently, vertically downward, or horizontally.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   2. Handrails Not Serving as Top Rails or Guard Rails: Design to be capable of withstanding the following loads:
      a. Concentrated load of 200 pounds applied at any point non-concurrently, vertically downward, or horizontally.
      b. Uniform load of 50 pounds per lineal foot applied non-concurrently, vertically downward, or horizontally.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Handrail and Screenwall System: Capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system including panels, intermediate rail balusters, or other elements composing the infill area.
    a. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guardrails.

B. Dimensions: See drawings for configurations and heights.
1. Top Rail: Profile, as detailed.
2. Bottom Rail: Profile, as detailed.
3. Posts: Profile as detailed.
4. Balusters: As detailed.
5. Infill: As detailed.
6. Pickets:
    a. Horizontal Spacing: Maximum 4 inches on center, unless shown otherwise.
    b. Top Mounting: Welded to underside of top rail.
    c. Bottom Mounting: Welded to bottom rail, unless otherwise indicated on drawings.

C. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.

D. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 ALUMINUM MATERIALS

A. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

B. Aluminum Tube: Minimum wall thickness of 0.127 inch; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

C. Solid Bars and Flats: ASTM B211/B211M.

D. Welding Fittings: No exposed fasteners; cast aluminum.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M Grade B Schedule 40, galvanized finish.

C. Wall-Mounted Rails: Steel fabrications, as detailed.

D. Top Rail: Steel fabrications, as detailed.

E. Bottom Rail: Steel fabrications, as detailed.

F. Infill: Metal panel infill material.

G. Posts: As detailed.

H. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

I. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

J. Straight Splice Connectors: Steel concealed spigots.

K. Galvanizing: In accordance with requirements of ASTM A123/A123M.
1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 MISCELLANEOUS MATERIALS

A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.

C. Fasteners:
   1. Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals which are corrosive or imcompatible with materials joined.
   2. Provide concealed fasteners for interconnection of handrail and railing components where welding is not feasible and for their attachment to other work, except where otherwise indicated.

D. Anchors and Inserts: Provide anchors of proper type, size, and material for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.05 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.06 FINISHES

A. Interior Railings: Shop primed, for Paint Finish:
   1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.

B. Exterior Railings: Shop galvanized, for Paint Finish:
   1. Preparation: Remove mill scale, and clean substrate in accordance with manufacturer's recommendations.

C. Repair galvanized coatings with galvanizing repair paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with Military Specification MIL-P-21035 (Ships) or SSPC Paint 20.

D. Intermediate Coat: One coat of the following, shop applied Tnemec "Series 66 HI-BUILD EPOXOLINE".

E. Finish Coats: See Section 09 9100 - PAINTING.

2.07 ALUMINUM FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

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.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

D. Take field measurements prior to fabrication.

3.03 INSTALLATION

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Perform cutting, drilling and fitting required for installation of handrails and railings. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

C. Install in accordance with manufacturer's instructions.

D. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

E. Install railings in compliance with ADA Standards for accessible design at applicable locations.

F. Anchor railings securely to structure.

G. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
   1. Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth, fill, sand, apply cold-process galvanizing repair paint, and touch-up shop paint coat.

H. Conceal anchor bolts and screws whenever possible.

I. Adjust handrails and railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by design loadings.

3.04 ANCHORING POSTS

A. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.

B. Anchor posts in concrete and stone by core drilling holes not less than 5" deep (excluding depth of stone veneer), and 3/4" greater than outside dimensions of posts. Clean holes of all loose material, insert posts and fill annular space between post and concrete with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
   1. Seal around rail penetration with pourable sealer, as specified in Section 07900 - Joint Sealers.
   2. Cover anchorage joint with flange or escutcheon plate attached to post after filling of annular space.

3.05 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100-percent contact or use manufacturer's standard fittings designed for this purpose.

3.06 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.

B. Anchor railing ends to metal surfaces by welding using manufacturer's standard concealed fittings, unless otherwise indicated.

C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip-joint internal sleeve, extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

3.07 ATTACHMENT OF HANDRAILS TO WALLS

A. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.

B. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.

C. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.

D. For stud partitions, use lag bolts fastened to 2 x 12 treated wood blocking between studs. Coordinate with spacing of studs for accurate location of blocking members.

3.08 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.09 PROTECTION

A. Protect finishes of railings and handrails from damage during construction period by use of temporary protection coverings approved by railing manufacturer. Remove protective covering at project completion or when directed by Architect.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

C. Remove all burrs and uneven surfaces, fill gaps, and insure a smooth rail.

END OF SECTION

SECTION 05 7200
ORNAMENTAL HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Railing and guardrail assemblies.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 05 5000 - Metal Fabrications: Supports.

C. Section 05 5213 - Pipe and Tube Railings: Other handrails not specified with stairs.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

B. ASTM B138/B138M - Standard Specification for Manganese Bronze Rod, Bar, and Shapes; 2011.

C. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

D. AWS C 3.4/C3.4M - Specification for Torch Brazing; 2007.

E. AWS C 3.5/C 3.5M - Specification for Induction Brazing; 2007.

F. AWS C 3.9/C 3.9M - Specification for Resistance Brazing; 2009.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2010.

H. AWS D1.6 - Structural Welding Code - Stainless Steel; 1999.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
   1. Contractor.
   2. Manufacturer's representative.
   3. Architect.
   4. Owner's representative.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.

C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
   1. Shop drawings shall be sealed, signed, and certified by a Registered Structural Engineer in the State in which the Project is located, to be in conformance with all requirements specified herein, and in conformance with all State and local codes and regulations.
      a. Include the design engineer's stamp or seal on each sheet of shop drawings.

D. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.

E. Manufacturer's Installation Instructions.

F. Maintenance Data: Manufacturer's instructions for care and cleaning.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company having performed at least 3 installations of comparable quality and size within last 3 years, and acceptable to manufacturer.

B. Mock-ups: Construct a railing of each type specified. Locate mock-ups where directed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver railing materials in factory provided protective coverings and packaging.

B. Protect railing materials against damage during transit, delivery, storage, and installation at site.

C. Inspect railing materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

D. Prior to installation, store materials and components under cover, in a dry location.

1.08 FIELD CONDITIONS

A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.

1.09 WARRANTY

A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 RAILING SYSTEMS

A. Railings - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
   1. Design Criteria: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
      a. Lateral Force: 75 lb minimum, at any point, when tested in accordance with ASTM E935.
      b. Distributed Load: 50 pounds per foot minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
      c. Concentrated Loads on Intermediate Rails: 50 pounds per square ft, minimum.
      d. Concentrated Load: 200 pounds minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
   2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
   3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
   4. Field Connections: Provide sleeves to accommodate site assembly and installation.
   5. Welded and Brazed Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
      a. Ease exposed edges to small uniform radius.
      b. Welded Joints:
         1) Carbon Steel: Perform welding in accordance with AWS D 1.1/D 1.1M.
         2) Stainless Steel: Perform welding in accordance with AWS D 1.6.
      c. Brass/Bronze Brazed Joints:
         1) Perform torch brazing in accordance with AWS C3.4/3.4M.
         2) Perform induction brazing in accordance with AWS C3.5/3.5M.
         3) Perform resistance brazing in accordance with AWS C3.9/3.9M

2.02 MATERIALS

A. Materials: As detailed, and as described below.

B. Stainless Steel Components:
   1. ASTM A666, Type 304.
   2. Stainless Steel Finish: No. 4 Satin.

C. Bronze Components: ASTM B138/B138M.

2.03 ACCESSORIES

A. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.

B. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry for bolting anchors.
   3. For anchorage to stud walls, provide backing plates for bolting anchors.
   4. Exposed Fasteners: No exposed bolts or screws.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Verify field dimensions of locations and areas to receive work.

C. Notify Architect immediately of conditions that would prevent satisfactory installation.

D. Do not proceed with work until detrimental conditions have been corrected.

E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

3.02 PREPARATION

A. Protect existing work.

B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.

C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.

C. Anchor securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

3.06 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
   1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Roof sheathing.

C. Roof-mounted curbs.

D. Roofing nailers.

E. Roofing cant strips.

F. Preservative treated wood materials.

G. Fire retardant treated wood materials.

H. Communications and electrical room mounting boards.

I. Concealed wood blocking, nailers, and supports.

J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

C. Section 05 3100 - Steel Deck.

D. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

E. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings, and self-adhered membrane flashing over sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

F. PS 1 - Structural Plywood; 2023.

G. PS 20 - American Softwood Lumber Standard; 2021.

H. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; 2019.

I. SPIB (GR) - Standard Grading Rules; 2021.

J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.

K. WWPA G-5 - Western Lumber Grading Rules; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

D. Submit proposed screw pattern layout for roof sheathing attachment, such that designed roof system meets 1-90 Wind Uplift Requirements.

E. Submit data sheets and samples of all fasteners.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, 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. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. Northeastern Lumber Manufacturer's Association (NeLMA).
   2. National Lumber Grades Authority (NLGA).
   3. Redwood Inspection Service (RIS).
   4. Southern Pine Inspection Bureau (SPIB).
   5. West Coast Lumber Inspection Bureau (WCLIB).
   6. Western Wood Products Association (WWPA).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Allowed under referenced grading rules.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Machine stress-rated (MSR) as follows:
      a. Fb-single; minimum extreme fiber stress in bending: 1350 psi.
      b. E; minimum modulus of elasticity: 1,300,000 psi.
   2. Species: Southern Pine, No. 2.
   3. Extent: As required, or indicated.

F. Roof Sleepers (1 by 4 inches).
   1. Species: Southern Yellow Pine.
   2. Grade: Construction or No. 2.
   3. Extent: Roof "Sleepers", and elsewhere as required or indicated.

G. For Structural Framing, 5 inches and wider, provide the following grade and species:
   1. "No. 2" grade, Stress Rated, with the following minimum properties:
      a. Fb = As indicated in Design Values for Wood Construction - NDS Supplement By The American Wood Council, LATEST Edition.
      b. E = As indicated in Design Values for Wood Construction - NDS Supplement By The American Wood Council, LATEST Edition.
   2. Species: Southern Yellow Pine.

H. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.03 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (15 percent maximum).

C. Surfacing: S4S.

D. Species: Southern Pine.

E. Grade: No. 2, 2 Common, or Construction.

2.04 CONSTRUCTION PANELS

A. Roof Sheathing: Fiberglass mat faced gypsum panel, with water resistant gypsum core. ASTM C1177/C1177M, square long edges, 5/8 inch Type X fire-resistant, unless otherwise indicated.
   1. GAF; Dens-Deck Prime Roof Board: www.gaf.com.
   2. Georgia-Pacific Gypsum LLC; DensDeck Prime Roof Board: www.densdeck.com.
   3. USG: Securock: www.usg.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Communications and Electrical Room Mounting Boards: UL verified fire retardant backboard: A-C plywood; 3/4 inch thick; Coated with UL Classified Fire Retardant Latex (Class "A" Rated). Tested to UL723 (ASTM E84) standards. Color: As selected by Architect from manufacturer's standard colors.
   1. Pre-Manufacturered Product:
      a. WoodBacker "Fire Retardant Backboards"; [Basis of Design]: www.woodbacker.com.
      b. U-TECK; Fire Retardant Backboard: www.uteck.com
      c. Readyspec Backboards, Inc; Fire Retardant Backboard: www.pathways-spaces.com/
      d. Substitutions: See Section 01 6000 - Product Requirements.

C. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.05 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: AISI Type 304 or 316 Stainless steel for fire-retardant wood and preservative-treated wood locations; hot-dipped galvanized steel per ASTM A 153/ A 153M for rough carpentry exposed to weather, in ground contact, or area of high relative humidity; unfinished steel elsewhere. Acceptable to manufacturer of wood treatment materials and manufacturer of fasteners.
   2. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Metal Framing Anchors:
   1. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
      a. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
      b. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehnsive testing performed by a qualified independent testing laboratory.
   2. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G90 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.
      a. Use galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and all other locations, and at every point of bearing.

b. Minimum Thickness: 18-gauge.

C. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Panel Sheathing Clips: Provide panel sheathing clips in quantity and location recommended by manufacturer. For use for all unsupported edges. Simpson Stong-Tie Panel Sheathing Clips PSCA, 20 gauge, galvanized. Substitutions: Section 01 6000 - Product Requirements.

E. Nails, Wire, and Brads: FS FF-N-105.

F. Power Driven Fasteners (screws): National Evalution Report NER-272.

G. Wood Screws: ANSI B18.6.1.

H. Lag Bolts: ANSI B18.2.1.

I. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

J. Anchors shall be manufactured by American manufacturer.

2.06 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.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in direct contact with the ground.
2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. All interior rough carpentry items in buildings of Type I or Type II construction are to be fire retardant treated.
c. All concealed wood blocking, framing and sheathing in buildings of Type I or Type II construction shall be fire retardant treated.
d. Review Life Safety Sheets and provide fire retardant treated wood blocking in all rated walls.
e. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
a. Treat lumber exposed to weather.
2. Treat lumber in contact with roofing, flashing, or waterproofing.
3. Treat lumber in contact with masonry or concrete.
4. Treat lumber less than 18 inches above grade.
a. Treat lumber in other locations as indicated.

5. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
    a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
    b. Treat plywood in contact with roofing, flashing, or waterproofing.
    c. Treat plywood in contact with masonry or concrete.
    d. Treat plywood less than 18 inches above grade.
    e. Treat plywood in other locations as indicated.

D. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
1. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
2. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

2.07 ENGINEERED WOOD PRODUCTS

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

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.

F. Provide the following specific nonstructural framing and blocking:
1. Cabinets and shelf supports.
2. Lab casework.
3. Wall brackets.
4. Handrails.
5. Grab bars.

6. Towel and bath accessories.
7. Wall-mounted door stops.
8. Chalkboards and marker boards.
9. Wall paneling and trim.
10. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members, unless tongue and groove sheathing is used.
   2. Provide sheathing clips at all unsupported edges.
   3. Screw panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 5000.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

SECTION 06 4000
CUSTOM ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Laminate clad countertops and cabinets, solid surface countertops and associated components, window sills, trim, similar work, and associated hardware.

B. Contractor's Option for fabricated Millwork in lieu of Laminate Casework: The General Contractor may, at its option, furnish and install Custom Architectural Woodwork in lieu of the specified Casework units. Where the General Contractor exercises this option, it shall demonstrate that the Custom Architectural Woodwork (Millwork) is in compliance with the requirements of this Section and is materially similar to the corresponding Casework item specified in Section 12 3219 - Laminate Casework.

1.02 SECTION INCLUDES

A. Laminate clad countertops.

B. Laminate covered cabinets (Contractor's Option to Section 12 3219 - Laminate Casework).

C. Wood cabinets, desks, and paneling.

D. Solid surface countertops, backsplashes, trim, wall caps & window sills, and vertical panels where indicated.

E. Manufactured quartz solid surface countertop, backsplashes and trim, where indicated; and vertical panels, where indicated.

F. Closet and utility shelving (paint on site, under Section 09 9100 - Painting).

G. Wood frames, sidelights, panels, base, window sills, and miscellaneous trim (paint on site, under Section 09 9100), stained (transparent finish) or painted (opaque finish) where indicated.

H. Hardware for architectural woodwork.

I. Related work and trim for above items.

J. Extent of each type of architectural woodwork is indicated on drawings and in schedules.

K. Architectural woodwork and components for opaque finish are intended to be finish painted on-site, under Section 09 9100 - Painting.

L. Architectural woodwork and components for natural, stained and/or transparent finish are intended to be painted in woodwork fabricator's shop under controlled conditions, under the work of this Section.

1.03 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 6623 - Resinous Matrix Terrazzo Flooring.
6. Section 09 9100 - Painting.
7. Section 12 3219 - Laminate Casework - Basis of Design where identified.
8. Division 22 Plumbing Sections: Countertops for sinks.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for Submittal procedures.

B. 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, anchorage systems, installation method, transition & accessory types.
2. Keying schedule.

C. 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 6-inches with finish as required for this project, and representative color range anticipated.
4. Solid Surfacing Products: Manufacturer's standard samples, approximately 4-inches x 4-inches, with finish as required for this project, and representative color range anticipated.
5. Laminate Products: Manufacturer's standard samples, approximately 4-inches x 4-inches, with finish as required for this project, and representative color range anticipated.

1.05 QUALITY ASSURANCE

A. AWS: Comply with applicable requirements of "Architectural Woodwork Standards" published by the Architectural Woodwork Standards, 2nd Edition, October, 2014.

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.

1.06 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.

1.07 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:
1. See Finish Legend for Manufacturers and colors.

C. Quartz-Surfacing Material: Subject to compliance with requirements, provide quartz countertop material of one the following. Color and finish indicated in drawings:
   1. Cambria: www.cambriaUSA.com [Basis of Design]
   2. CaesarStone: www.caesarstoneUS.com.
   3. Hanstone: www.hanwhasurfaces.com.
   4. Silestone: www.silestoneusa.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

D. Solid-Surfacing Material/Manufacturer: Homogeneous solid sheets of cast, filled acrylic resin complying with material and performance requirements in ANSI Z124.3, for Type 6.
   1. See Finish Legend for manufacturers and colors.
   2. Substitutions: See Section 01 6000 - Product Requirements.

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: See Finish Legend.
   3. Cut: See Finish Legend.
   4. Locations: Provide stained transparent finish within rooms which have new woodwork with transparent finish, at indicated areas. Refer to Elevations & Finish Schedule.

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, Section 11-Countertops.

B. Type of Top - Laminate Clad:
   1. Grade: Premium; Grade I.
   2. Edge Treatment: Refer to Drawings.
   3. Core: Minimum 47-lb. density particle board, except at least 3/4-inch A-B plywood with exterior glue (approved for interior use), at tops with sinks and/or plumbing fixtures.
   4. Minimum Thickness: 1-1/4-inches at tops and 3/4-inch at splashes, unless indicated otherwise on the Drawings.

C. 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): 1/2-inch, 3/4-inch substrate & with 1-1/2-inch built-up edges unless indicated otherwise on the Drawings.
      b. Backsplash & Sidesplash: 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.

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 nominal thickness, through color, colors as scheduled, finish as scheduled.
      b. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      c. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      d. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      e. Flame Retardant Surfaces: HGF, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      f. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      g. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

C. Hardboard: AHA A135.4 (tempered).

D. Melamine 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 INTERIOR FRAMES AND JAMBS

A. Quality Standard: Comply with AWS Section 10.
   1. Grade: Premium.

B. Wood Species:
   1. For Opaque Finish: Any closed-grain hardwood listed in referenced woodworking standard.
   2. For Transparent Finish (stained): Match wood doors.

C. Fire Rated Frames:
   1. 20 min and 45 min rated types. Refer to Door Schedule.

D. Jamb Type: Flat jamb, unless indicated otherwise.

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 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.

2.12 CABINET HARDWARE

A. 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.

B. Cabinet Door and Drawer Pulls:
   1. Wire pulls, equivalent to Stanley No. 4484, stainless steem (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.

C. 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.

D. 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.

E. Cabinet Shelf Standards: Manufacturer's standard steel units with anchors and supports 5/8-inch wide x 3/16-inch high, adjustable on 1/2-inch centers; Series 255, as manufactured by K&V, or equivalent by Grant or Stanley.
   1. Wood Cabinets: Model No. 255 BRN with No. 256 BRN supports and matching fasteners.
   2. Omit standards where fixed shelves are indicated.
   3. All standards to be recess mounted (flush in routed dados), unless specifically indicated otherwise.

F. Cabinet Locks: Provide cabinet manufacturer's standard 5-disc tumbler, cam type, keyed differently at each room for each file drawer & where indicated on drawings , 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. Bamboo Flooring (for vertical, and horizontal surfaces): Install in accordance with manufacturer's recommendations.

F. 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.

G. 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.

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.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Self-adhered rubberized asphalt sheet membrane.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 03 3000 - Concrete: Concrete substrate (floors and walls).

C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal termination bar.

D. Section 07 9010 - Joint Sealers: Sealant for joints in substrates.

E. Section 31 2000 - Earth Moving.

F. Section 33 4600 - Subdrainage.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

D. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's Installation Instructions: Indicate special procedures and acceptable installation temperatures.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

F. Specimen Warranty.

G. LEED Submittals:
   1. For products specified in this Section, submit documentation of recycled content and location of manufacture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Single Source Responsibility:
   1. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer.
   2. Blind-side waterproofing products and sheet waterproofing for below-grade walls shall be provided by same manufacturer for single source responsibility and materials compatibility.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
   1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
   2. Protect mastic and adhesive from moisture and potential sources of ignition.
   3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
   4. Protect surface conditioner from freezing.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.07 PROJECT/SITE CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and perparation work is complete and in condition to receive sheet membrane waterproofing.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty upon completion of the work. , except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 - PRODUCTS

2.01 SHEET WATERPROOFING APPLICATIONS

A. Self-Adhered Rubberized Asphalt Sheet Membrane:
   1. Location: All below grade and foundation walls.
   2. Cover with protection board.

2.02 MANUFACTURERS/PRODUCT

A. W. R. Grace & Co.-Conn. Preprufe 300R (for below-slab), and Bituthene System 4000 Membrane (for below grade walls) [Basis of Design]: www.graceconstruction.com.

B. Other Acceptable Manufacturers (Subject to meeting specifications):
   1. Carlisle Coatings & Waterproofing, Inc; Product CCW Miraweld-H (for below-slab), and CCW MiraDRI 860/861 (for below grade walls): www.carlisle-ccw.com.
   2. W. R. Meadows: www.wrmeadows.com ; Product Precon (for below-slab), and MEL-ROL (for below grade walls).
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SHEET WATERPROOFING MATERIALS

A. Self-Adhered Rubberized Asphalt Sheet Membrane:
   1. Thickness: 63 mil, 0.061 inch, minimum.
   2. Sheet Width: 3.28 feet, minimum.
   3. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
   4. Products:
      a. W. R. Grace: Bituthene 4000: www.gcpat.com
      b. Carsile; CCW MiraDRI 860/861: www.carsileccw.com
      c. W. R. Meadows; MEL-ROL: www.wrmeadows.com

B. Sheet Waterproofing (for blind side waterproofing of Below Grade Slab): Multi-layered composite sheet consisting of HDPE film, protective coating with pressure-sensitive adhesive and removable release liner; having an overall nominal thickness of 0.046 in. (1.2mm). Product is applied over prepared substrate, ready to receive cast concrete onto the adhesive side of the membrane.

C. Sheet Waterproofing (for Below Grade Wall): Flexible, pre-formed waterproof composite membrane consisting of 0.056 in. (1.4mm) rubberized asphalt, and 0.004 in. (0.1mm) of cross-laminated, high density polyethylene film (HDPE) with self-adhesive surface, and with removable release sheet.
   1. Use with water-based surface conditioner formulated to prepare substrate for waterproofing membrane.

D. Termination Bars: Stainless steel; compatible with membrane and adhesives. (See Section 07 6200.)

E. Surface Conditioner: Type compatible with membrane.

2.04 ACCESSORIES

A. Drainage Panel: 0.433 inch thick geocomposite drainage sheet system, comprising a hollow studded polystyrene core, covered on one side with a nonwoven, needle punched polypropylene filter fabric and on the other side with a smooth polymeric film. Drainage panel may serve as protection board if approved by manufacturer. Provide separate protection board if recommended by manufacturer.

B. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, terminations, cants, tape and accessories: acceptable to manufacturer of sheet membrane waterproofing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Cast-In-Place Concrete Substrate:
   1. Do not proceed with installation until concrete has properly cured and dried - minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete.
   2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
   3. Repair bugholes over 0.5 inch in length and 0.25 inch deep and finish flush with surrounding surface.
   4. Remove scaling to sound, unaffected concrete and repair exposed area.
   5. Grind irregular construction joints to suitable flush surface.

E. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.

F. Treat joints and install flashing as recommended by waterproofing manufacturer.

G. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.

C. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.

D. Roll out membrane, and minimize wrinkles and bubbles.

E. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

F. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

G. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

H. Ensure plastic release liner is removed from underslab waterproofing before pouring concrete is poured.

I. Pour concrete over underslab waterproofing within time recommended by manufacturer from date membrane is placed.

J. Place and compact concrete over underslab waterproofing carefully to avoid damage to the membrane. Avoid use of sharp objects to consolidate concrete.

K. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

L. Seal daily terminations with troweled bead of mastic.

M. Install termination bar at top of waterproofing.

N. Seal membrane and flashings to adjoining surfaces.

O. Installation shall be according to manufacturer's details to satisfy warranty requirements.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Apply protection board and related materials in accordance with manufacturer's recommendations.

B. Adhere protection board to substrate with compatible adhesive.

3.05 CLEANING

A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

3.06 PROTECTION

A. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION

SECTION 07 1400
FLUID-APPLIED AIR BARRIER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fluid applied vapor permeable membrane air barrier:
   1. For application on exterior side of exterior sheathing where used in vertical and other non-horizontal applications.
   2. For application on exterior side of CMU walls.

B. Sealants for substrates of fluid-applied air barrier.

C. Cant strips and other Other Accessories.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 04 2000 - Unit Masonry: Masonry joints prepared to receive flashings.

C. Section 07 1300 - Sheet Waterproofing: Sheet membrane waterproofing for below grade slab and walls.

D. Section 07 6200 - Sheet Metal Flashing and Trim: Metal parapet covers, copings, and counterflashings.

E. Section 07 9010 - Joint Sealers: Sealant for joints other than substrates for air barrier in this Section.

F. Section 09 2116 - Gypsum Board Assemblies: Exterior sheathing receiving fluid-applied air barrier.

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 C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2018 (Reapproved 2022).

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

D. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for air barrier system(s) specified.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures and acceptable installation temperatures.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in fluid-applied air barrier membranes with ten years experience.

B. Installer Qualifications: Company specializing in installation of fluid-applied air barrier with minimum five years documented experience.

C. Mock-Up: Include Fluid-Applied Air Barrier in Mock-Up as described in Section 01 4000 - Quality Requirements.

D. Comply with ALL special requirements and inspections of air barrier system manufacturer, as required to obtain the required 5-year labor and materials warranty.

E. Single-Source Responsibility: Obtain primary air barrier materials of each type required from a single manufacturer.

F. Sealant for Substrate Surfaces: Sealant shall be manufactured by same manufacturer as fluid-applied air barrier.

1.06 FIELD CONDITIONS

A. Maintain range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply product to wet substrate or during snow, rain, fog, or mist.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five (5) year manufacturer warranty for air barrier failing to resist penetration of water , except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fluid-Applied Waterproofing Vapor Permeable Air Infiltration Barrier System (for CMU and Sheathing):
1. GE "Elemax 2600 AWB" 100% Silicone Air and Water-Resistive Barrier system; [Basis of Design]: www.siliconeforbuilding.com/AWB/.
2. Dow Corning "DefendAir 200" Silicone Liquid Applied Air & Weather Barrier: www.dowcorning.com.
3. Pecora "XL-Perm Ultra VP" Air, Vapor & Water Barrier System: www.pecora.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FLUID APPLIED WATERPROOFING MATERIALS

A. Fluid-Applied Air Barrier - General: Cold-applied elastomeric fluid-applied membrane.
1. General: Provide fluid-applied air barrier system that is watertight and complies with performance requirements specified, as demonstrated by testing performed by a nationally recognized independent testing laboratory of manufacturer's standard systems according to test methods indicated.
2. Fluid-applied air barrier system shall be compatible with specified substrate.

B. Liquid Air Infiltration Barrier, Vapor Permeable, Cold-Applied Elastomeric Membrane:, complying with ASTM C 836, one component. (For CMU, Sheathing, and as indicated).
1. Cured Thickness: Comply with manufacturer's recommendation to meet performance specified.
2. Suitable for installation over concrete, and sheathing substrates.
3. UV Resistant.
4. Membrane Air Permeance ASTM E2178: Not to exceed 0.004 cfm/sq. ft. of surface area (at specified thickness) at test pressure of 0.3 in. water (75 Pa) on CMU block.
5. Membrane Vapor Transmission per ASTM E96, Method B: Not less than 10 perms.
6. Product shall withstand weather exposure up to 6 months.

C. Flexible Flashings: Type recommended by membrane manufacturer.

2.03 ACCESSORIES

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Joint Reinforcing/Transition Strip: 2" wide glass fiber tape, self-adhesive polymeric air/vapor barrier membrane (30 mil minimum), or other material applicable for application, which is approved by air barrier manufacturer.

C. Surface Conditioner: Compatible with membrane compound; as recommended by membrane manufacturer.

D. Sealant for Substrate Surfaces: As recommended by membrane manufacturer.

E. Liquid Membrane for details and terminations: As recommended by membrane manufacturer.

F. Detail Membrane: Flexible, fully-adhered membrane for detail flashing areas: As recommended by membrane manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter, including efflorescence, detrimental to adhesion or application of air barrier system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of air barrier materials.

D. Verify that items that penetrate surfaces to receive air barrier are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive air barrier.

B. Do not apply air barrier to surfaces unacceptable to manufacturer.

C. Caulk sheathing joints prior to application of water/air barrier coating. Caulk with manufacturer-recommended joint sealant reinforced with fiberglass mesh tape encapsulated in sealant. Encapsulate fastener heads with manufacturer-recommended sealant. Fiberglass reinforcement is not required for sheathing fastener heads.
   1. Verify that Fluid-Applied air barrier is compatible with sealant used.

D. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

E. All surfaces must be sound and free from spalled areas, loose aggregate, loose nails or screws, sharp protrusions or other matter that will hinder the adhesion or regularity of the membrane installation. The surface must also be free from frost, dirt, grease, oil or other contaminants. Clean loose dust and dirt from the surface by brushing or wiping with a clean, dry cloth.

F. Concrete and other monolithic cementitious surfaces: Pretreat surface irregularities and large voids with liquid membrane, or repair with lean mortar mix or nonshrinking grout.

G. CMU surfaces: Strike joints full and flush to face of concrete block. Ensure surface is smooth and free from projections. Fill voids and holes with lean mortar mix or nonshrinking grout.

H. Sheathing panels: Fasten corners and edges with appropriate screws. Drive fasteners flush with panel surface (not countersunk). Tape panel butt joints with 2 in. wide sheathing tape recommended by manufacturer.

I. Complete detailing prior to applying air barrier.

J. Fill and seal cracks and joints between exterior sheathing panels or adjacent substrates, or in masonry, with trowel application of air barrier product and reinforce with strip of 2" (minimum) wide glass fiber tape. Follow manufacturer's instructions if other joint treatment is recommended. Allow recommended cure time before proceeding.

K. Proceed with applying air barrier only after substrate cleaning, sealing, and other preparation and sealing of joints and penetrations have been completed.

3.03 INSTALLATION

A. Apply air barrier in accordance with manufacturer's instructions to specified minimum thickness.

B. Apply surface conditioner (if required) at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

C. Apply by spray a complete and continuous unbroken film of liquid air and water barrier membrane.

D. Apply air barrier in accordance with manufacturer's instructions to uniform wet film thickness in order to dry to thickness recommended by manufacturer to achieve performance specified.
   1. Apply more than one coat, if recommended by manufacturer.

E. Roll the air barrier after spray application to fill all pin holes.

F. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.04 FIELD QUALITY CONTROL

A. Owner will provide testing services in accordance with Section 01 4000 - Quality Requirements. Contractor to provide temporary construction and materials for testing.

B. Provide periodic on-site attendance of waterproofing, airbarrier, roofing and insulation manufacturer's representative during installation of this work.

3.05 CLEANING AND PROTECTION

A. Do not inhibit damp substrate from drying out. Do not expose the backside of the substrate to moisture or rain.

B. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

C. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 180 days.

D. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construcion.

E. Remove masking materials after installation.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarderat cavity wall construction, and as indicated.

B. Batt insulation in walls where indicated.

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 04 2000 - Unit Masonry Assemblies: Cavity walls for board insulation.

C. Section 05 4000 - Cold-Formed Metal Framing: Supporting structure for batt insulation, where indicated.

1.03 REFERENCE STANDARDS

A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 MOCK-UP

A. Include Thermal Insulation in mock-up as described in Section 01 4000 - Quality Requirements.

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: Extruded polystyrene (XPS) carbon black board.

B. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

C. Insulation Above Ceilings (where indicated): Batt insulation with foil-scrim-kraft (FSK) faced vapor retarder. Batt insulation with no vapor retarder (i.e. unfaced batts) where used with sheet vapor barrier.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation at masonry cavity walls: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: As indicated in the Drawings.
   5. Products:
      a. Dow Chemical Company: www.dow.com.
      b. DiversiFoam Products: www.diversifoam.com.
      c. Owens Corning Corp: www.owenscorning.com.
      d. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com.

B. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.6 (0.98), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Board Size: 15-3/4 inch by 96 inch.
   5. Board Thickness: As indicated in the Drawings.
   6. Board Edges: Square.

2.03 BATT INSULATION MATERIALS

A. Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C 665; friction fit; unfaced; flame spread index of 0 (zero) when tested in accordance with ASTM E 84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E 84.
   2. Formaldehyde Content: Zero.
   3. Thickness: As required to meet the following requirements:
      a. Roof: R=30.
      b. Exterior walls: R=19.
      c. Interior walls: Thickness of Studs.
   4. Facing: Unfaced in interior walls, and where used above ceilings in conjunction with Class A sheet vapor barrier.
   5. Facing: Foil-scrim-kraft (FSK) on one side; under trusses where no sheet vapor barrier is used to support batts.
   6. Products:
      a. Owens Corning: www.owenscorning.com.
      b. Knauf Insulation: www.knaufinsulation.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Tape: Polyethylene self-adhering type, 1.75 inch wide minimum, unless greater width recommended by manufacturer.
   1. 3M "Construction Seaming Tape 8087": www:3M.com.
   2. Dow "Weathermate Construction Tape": www.dowbuildingsolutions.com.
   3. Typar "Typar Construction Tape": www.typar.com.

B. Adhesive: Type recommended by insulation manufacturer 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.

3.02 BOARD INSTALLATION AT CAVITY WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Apply beads of adhesive oriented vertically so as not to disrupt the drainage plane between the water/air barrier coating and cavity insulation.

C. Install boards to fit snugly between wall ties.

D. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and protrusions.
4. Tape seal board joints.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Place 6 inches wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.03 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

D. Retain insulation batts under overhead joists/rafters/trusses with sheet vapor barrier under framing members.

E. Install sheet vapor barrier under trusses with foil facing down. Overlap layers as recommended by manufacturer. Attach vapor barrier as recommended by manufacturer. Tape joints with reinforced foil tape recommended by manufacturer.

F. Lay insulation batts over top of sheet vapor barrier.

G. All wet insulation shall be removed and replaced. Provide letter to Architect for record of each occurrence.

H. Visible gaps and voids for insulation on sheet vapor barrier shall be filled.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

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SECTION 07 4210
COMPOSITE FRAMING SUPPORT (CFS) CI SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Composite Framing Support (CFS) CI System with in-fill insulation integrated with fiber cement exterior wall cladding and metal wall panels.
   1. Substrate: Exterior sheathing over metal stud framing, concrete masonry units (CMU), and cast-in-place concrete.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 – Cast-in-Place Concrete: Concrete wall substrate

B. Section 04 2000 – Unit Masonry: Concrete masonry unit (CMU) wall substrate

C. Section 05 4000 – Cold-Formed Metal Framing: Metal stud substrate support framing

D. Section 06 1000 – Rough Carpentry: Exterior sheathing and wood stud substrate support framing

E. Section 07 1400 – Fluid-Applied Air Barrier: Air, water, vapor barrier at exterior wall

F. Section 07 2100 - Thermal Insulation: Board insulation

G. Section 07 4200 – Fiber Cement Siding: Wall cladding system

H. Section 07 4213 - Metall Wall Panels: Metal wall panel system

I. Section 07 9200 – Joint Sealants: Perimeter sealant

J. Section 09 2116 – Gypsum Board Assemblies: Exterior sheathing

1.03 REFERENCE STANDARDS

A. ASCE American Society of Civil Engineers (www.asce.org)
   1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2016 with Supplements and Errata
   2. ASCE – Structural Plastics Design Manual

B. ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers (www.ashrae.org)
   1. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019

C. ASTM International (American Society for Testing and Materials; www.astm.org)
   1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015
   2. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2015
   3. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013
   4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014
   5. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015
   6. ASTM C1177/C1177M – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013
   7. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2011
   8. ASTM C1396/C1396M – Standard Specification for Gypsum Board; 2014a
   9. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010e1
   10. ASTM D570 – Standard Test Method for Water Absorption of Plastics; 2010e1
   11. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014
   12. ASTM D638 – Standard Test Method for Tensile Properties of Plastics; 2014

13. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer; 2008e1
14. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics; 2015
15. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2010
16. ASTM D792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2013
17. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 2013a
18. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012
19. ASTM D4385 - Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products; 2013
20. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a
21. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2015
22. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 04(2012)
23. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013

D. IBC – International Building Code (International Code Council); 2021

E. NFPA – National Fire Protection Association (www.nfpa.org)
   1. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2015

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate construction of wall cladding support system over substrate indicated for proper drainage, flashing, trim, back-up support, soffits, and other related Work.
   1. Review and finalize construction schedule.
   2. Verify availability of materials, installer's personnel, equipment, and facilities needed to maintain schedule.
   3. Review means and methods related to installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment and attachment to structural support system.
   5. Review flashings, wall cladding details, wall penetrations, drainage plane, openings, and condition of other construction that affects this Work.
   6. Review temporary protection requirements for during and after installation of this Work.

1.05 SUBMITTALS

A. See Section 01 3000 – Administrative Requirements, for submittal procedures.

B. Product Data: Submit for each type of product indicated; include construction details, material descriptions, dimensions of individual components and profiles, and accessories as necessary for complete fully functioning and assembled system.
   1. Continuous insulation support system attachment methods and required fasteners
   2. Wall-mounted items including doors, windows, louvers, and lighting fixtures
   3. Wall penetrations including pipes, electrical fixtures, and any other utilities

C. Test and Inspection Reports: Submit test and inspection reports on each type of wall cladding/veneer system based on evaluation of comprehensive tests performed by nationally recognized testing agency.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with at least five years of documented experience.

B. Installer: Company specializing in performing work of this section and the following:

1. Install system in strict compliance with manufacturer's installation instructions.
2. Have not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original unopened containers and packaging with labels clearly identifying product name and manufacturer.

B. Deliver components and other manufactured items or accessories without damage or deformation.

C. Storage: Store materials in clean, dry, and level interior areas or outdoor areas for limited duration in accordance with manufacturer's written instructions.

D. Protect components and auxiliary accessories during transportation, handling, and installation from moisture, excessive temperatures and other construction operations in accordance with manufacturer's written instructions.

E. Handle components in strict compliance with manufacturer's written instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface, edge or corner damage.

1.08 SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work in accordance with manufacturer's written installation instructions and warranty requirements.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. CFS System Warranty: Provide written warranty by manufacturer agreeing to correct defects in manufacturing within five years after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Composite Framing Support (CFS) System Manufacturer:
   1. Advanced Architectural Products (A2P) "SMARTci GreenGirt 2-in-1 System [Basis of Design]: www.greengirt.com
      a. Substitutions: Section 01 6000 - Product Requirements

2.02 DESCRIPTION

A. Attach CFS sub-framing system components to exterior sheathing over metal stud framing, concrete masonry units (CMU), and cast-in-place concrete.
   1. Refer to Section 05 4000 for metal stud framing.
   2. Refer to Section 03 3000 for concrete substrate.
   3. Refer to Section 04 2000 for CMU substrate.

B. Install CFS sub-framing system components as outlined in the drawings on framed sheathing substrate system as indicated on drawings in compliance with specified requirements.

C. Install CFS sub-framing system components as outlined in the drawings on masonry, or concrete substrate system as indicated on drawings in compliance with specified requirements.

2.03 PERFORMANCE REQUIREMENTS

A. Structural: Provide system tested in accordance with ASTM E330/E330M and certified to be without permanent deformation or failure of structural members in accordance with design wind velocities for project geographic location and probability of occurrence based on data from wind velocity maps provided in ASCE 7 and as approved by authorities having jurisdiction (AHJ).

B. System Thermal Design: Ensure installed insulation and CFS sub-framing system, rough opening trim, sub-framing, clips and cladding attachment does not have thermal bridging of fasteners or framing that creates a continuous metal path from exterior surface of insulation to interior face of insulation.
   1. System thermal design shall meet or exceed thermal design requirements in compliance with ASHRAE 90.1 energy code.

C. Temperature: Comply with structural loading requirements within a temperature range of minus 55 degrees Fahrenheit to 190 degrees F.

D. Fire-Test-Response Characteristics: Provide composite metal hybrid (CMH) sub-framing support system with fire-test results indicated as determined by test standard indicated and applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
   1. Surface Burning Characteristics: In compliance with ASTM E84, for foam insulation, composite metal hybrid and interior surfaces are as follows:
      a. Flame Spread Index (FSI): 25 or less.
      b. Smoke Developed Index (SDI): 450 or less.
   2. Intermediate Scale Multistory Fire Test: Comply with NFPA 285 and/or IBC acceptance criteria for wall height above grade and fire separation distances, when wall type and other noted conditions require such testing or compliance with requirements as indicated.

2.04 COMPOSITE FRAMING SUPPORT (CFS) CI SYSTEM

A. CFS System: Provide CFS system consisting of polyester resin matrix with recycled materials, fire retardant additives and reinforced with integral continuous metal inserts the length of profile at all fastening locations. Reinforce CFS sub-framing systems with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
   1. Depth of Girt: As indicated on Drawings.
   2. On Center Spacing: 16 inch
   3. Orientation: As required by wall cladding.
   4. Provide continuous stainless-steel insert for engagement of fasteners, at least 16 gauge thick with G90 galvanized coating designation in compliance with ASTM A653/A653M.
      a. Fully engage and secure steel insert with adjacent CFS at ends, allowing for thermal expansion.
      b. Anchor sub-girts and other wall cladding support accessories to steel insert set into and part of CFS.
   5. Provide integral compression seal in CFS sections to ensure insulation panel will not dislodge.
   6. Provide integral anti-siphon grooves on exterior and interior flanges of CFS.
   7. Provide force distribution zones integrally designed into profile of CFS.
   8. Surface Burning Characteristics:
      a. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
      b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   9. Self-Extinguishing: Comply with ASTM D635.
   10. Modulus of Elasticity: Engineered to meet performance loading creiteria and specified safety factors
   11. Barcol Hardness: 45, in accordance with ASTM D2583.
   12. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with ASTM D570.
   13. Density: Within range of 0.062 to 0.070 lbs./cubic inch, in accordance with ASTM D792.
   14. Lengthwise Coefficient of Thermal Expansion: 7.0 x 10¯6 inch/inch/degrees F, in accordance with ASTM D696.
   15. Notched Izod Impact, Lengthwise: 160 ft lbs./inch, in accordance with ASTM D256 within temperature range indicated.
   16. Notched Izod Impact, Crosswise: 100 ft lbs./inch, in accordance with ASTM D256 within temperature range indicated.

2.05 ACCESSORIES

A. Provide accessories necessary for complete CFS system including metal closure trim, sealing tape (as recommended by manufacturer), and similar items.

B. Fasteners: Stainless steel, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as recommended by CFS sub-framing system manufacturer for CFS material and project application. Fully encapsulate all penetrations of air and water barrier with sealant.
   1. Cladding and Metal Wall Panel to CFS: Use standard self-tapping metal screws.

2. CFS to Sheathing on Metal Stud Wall Framing: Use standard self-tapping metal screws.
3. CFS to Concrete and CMU: Use standard masonry or concrete screw anchors in predrilled hole.
4. DO NOT USE powder, air, or gas actuated fasteners or actuated fastener tools. DO NOT USE impact wrenches when fastening to or from the CFS.

C. Fluid Applied Barriers: Refer to Section 07 1400 for requirements.

D. Sealants: Refer to Section 07 9200 for sealant information.

E. Closure and Transition Accessories: Use metal angles and flat stock per standard system details.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas of this work, and project conditions with installer present for compliance with requirements for installation tolerances, substrates, CFS sub-framing system conditions, and other conditions affecting performance of this Work.

B. Examine structural wall framing to ensure that angles, channels, studs, and other structural support members have been installed within alignment tolerances required by CFS sub-framing system manufacturer.

C. Examine rough-in for components and systems penetrating CFS sub-framing system to coordinate actual locations of penetrations relative to CFS sub-framing systems joint locations prior to installation.

D. Verify that mechanical and electrical services for exterior walls have been installed and tested and, if appropriate, verify that adjacent materials and finishes are dry and ready to receive insulation.

E. Proceed with installation only after wall substrate surfaces have been properly prepared and unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by CFS manufacturer for achieving best result for substrate under project conditions.

C. Prepare sub-framing, base angles, sills, furring, and other CFS sub-framing system members and provide anchorage in accordance with ASTM C754 for substrate type and wall cladding type in accordance with manufacturer’s installation instructions.

3.03 INSTALLATION

A. Install CFS sub-framing system in accordance with manufacturer's installation instructions.

B. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.

C. Trim insulation neatly to fit spaces and insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of insulation.

E. Exposed insulation must be protected from open flame.

F. Exterior wall insulation is not intended to be left exposed for extended periods of time without adequate protection.

G. Install CFS sub-framing system in compliance with system orientation, sizes, and locations as indicated on drawings.

3.04 TOLERANCES

A. Shim and align CFS sub-framing system within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb, and on location lines as indicated.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Ensure that insulation panels are not exposed to moisture.

1. Remove wet insulation panels or allow them to completely dry prior to installation of CFS sub-framing system.

C. Replace damaged insulation prior to Date of Substantial Completion.

END OF SECTION

SECTION 07 4291
ALUMINUM SOFFIT SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY:

A. This Section includes the following:
   1. Aluminum soffit and fascia systems, with hold-down clips, trim and accessories.

B. Related Sections include the following:
   1. Division 7 Section "Flashing and Sheet Metal" for elastic and metal flashing.
   2. Division 7 Section "Manufactured Roof Specialties" for fascia.
   3. Division 7 Section “Joint Sealants” for field-applied sealants.

1.03 SUBMITTALS:

A. Product Data: For each type of product specified. Include identification of materials; dimensions of individual components; installation instructions; and available profiles, textures, and colors.

B. Shop Drawings: Showing layout, dimensions, material thickness, details, joints, supports, trim, and accessories.

C. Samples for Initial Selection: Manufacturer’s sample finishes showing the full range of colors, profiles, and textures available.

D. Samples for Verification: Full-size units of each type of wall panel, soffit, and trim indicated; in sets for each color, texture, and pattern specified.
   1. 12-inch-long-by-actual-width sample of soffit.

E. Research/Evaluation Reports: Evidence of wall panel, and soffit systems’ compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.04 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced installer who has completed soffit installations similar in material, design, and extent to that indicated for Project that has resulted in construction with a record of successful in-service performance.
   1. Refer to Division 1 Section “Special Conditions” for additional information and minimum experience requirements.

B. Source Limitations for System and Accessories: Obtain each color, texture, pattern, and type of wall panel, soffit, and related accessories from one source, with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to Project site in manufacturer’s unopened packages or bundles with labels intact.

B. Store materials in a dry, well-ventilated, weathertight place. Do not store even temporarily on the ground. Comply with manufacturer’s written instructions for storage, handling, and protection.
   1. Refer to Division 1 Sections “Summary of Work” and “Special Conditions”, for additional information and requirements regarding stored materials.

1.06 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with soffit system installation only if existing and forecasted weather conditions permit the systems to be installed according to manufacturer’s current written instructions and if substrate is completely dry.

1.07 WARRANTY:

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run

concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Project Warranty: Submit a written warranty, executed by wall panel, soffit system manufacturer, agreeing to repair or replace soffit, and siding systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 color-difference units as measured according to ASTM D 2244.
   1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS/PRODUCT:

A. Manufacturer/Product: Peterson Aluminum Corp., Kennesaw, GA; "Flush Soffit" [Basis of Design]: www.pac-clad.com.

B. Other Manufacturers: Subject to compliance with these specifications and other requirements as indicated, provide products by one of the following:
   1. Alcoa Building Products.
   2. Reynolds Metals Co.
   3. Sentriclad Architectural Metals.

2.02 MATERIALS:

A. ASTM B-209 quality Aluminum, 3105 H-14 Alloy and Temper material. Aluminum shall be tension leveled (temper passed and stretcher leveled) with camber a maximum of 1/4 inch in 20 feet, manufactured in the USA, and be 0.032" thick Aluminum U.S. standard gauge.

2.03 SOFFIT:

A. Formed Aluminum Soffit: Aluminum soffit complying with AAMA 1402 shall meet the requirements of this section, fabricated from aluminum sheet in alloy recommended in writing by soffit and fascia system manufacturer, and as follows:
   1. Pattern: 12-inch exposure with smooth (standard) panel. No pencil ribs.
   2. Depth: 1"
   3. Ventilation: Provide non-perforated soffit.
   4. Finish: Fluoropolymer (Kynar) finish: AAMA 2605, three coat.
      a. Color: As selected by Architect from manufacturer's full range of colors.
   5. Provide manufacturer’s standard metal channel supports, trim, accessories, and hold-down clips at 24-inches o.c. maximum, and as otherwise required to prevent wind blow-out of soffit material.

2.04 FASCIA:

A. Formed Aluminum Fascia: Aluminum fascia complying with AAMA 1402 shall meet the requirements of this section, fabricated from aluminum sheet in alloy recommended by soffit and fascia system manufacturer, and as follows:
   1. Pattern and Configuration: To match soffit as indicated in the Drawings.
   2. Finish: Fluoropolyer (Kynar) finish: AAMA 2605, three coat.
      a. Color: As selected by Architect from manufacturer's full range of colors.
   3. Provide manufacturer’s standard metal channel supports, trim, accessories, fasteners, and hold-down clips as required or recommended by manufacturer to prevent wind blow-off.

2.05 ACCESSORIES:

A. Trim shall be fabricated of same material and finish to match the profiled sheeting and press broked in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer or approved dealer. Trim to be erected in overlapped condition. Miter conditions shall be factory welded materials to match the sheeting.

B. Decorative Accessories: Provide the following types of decorative accessories as indicated:
   1. Corner trim.
   2. Moldings and trim.

C. Fasteners shall be 400 Series stainless steel, dished washers stainless steel with bonded neoprene.

D. Zees: Where required by design of primary structural framing system shall be used to span between beams and/or joists. Thermally responsive base and top clips shall be fastened to the zees on 12" centers.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates for compliance with requirements for substrates, flashings, vapor/moisture barrier completion, water-tightness, installation tolerances, completed painting of framing and decking above perforated soffits, and other conditions affecting performance of soffit systems and accessories.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Clean substrates of projections and substances detrimental to application.

B. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

3.03 INSTALLATION:

A. General: Comply with soffit system manufacturer's current written installation instructions applicable to products and applications indicated, unless more stringent requirements apply. Center nails in elongated nailing slots without binding soffits, trim and siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.

B. Install aluminum soffit, and accessories according to AAMA 1402.

C. Where perforations in soffit material allow viewing through perforations, install with that side of perforations toward building wall.

D. Isolate dissimilar metals by separating from soffit, fascia and aluminum siding with rubber gaskets, elastomeric sealant, or rubber washers where fasteners penetrate soffits, fascia and siding. Dissimilar metals behind soffit systems may be isolated by covering with polyethylene film, except where use of plastic film would restrict air flow of ventilated soffit systems.

E. Remove all strippable coating and provide a dry wipe-down cleaning of the panels as they are erected.

F. Panels attached to any treated lumber must have an appropriate vapor barrier installed over the treated lumber prior to installing any soffit panels or related flashings. Do not allow any metal products to come into direct contact with treated lumber.

3.04 ADJUSTING AND CLEANING:

A. Remove and replace damaged, improperly installed, or otherwise defective soffit materials with new materials complying with specified requirements.

B. Clean finished surfaces according to soffit manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

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SECTION 07 4300
COMPOSITE WALL PANELS (CEMENTITIOUS CLADDING)

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Exterior, panelized fiber cement cladding system and accessories to complete a drained and back- ventilated rainscreen.

B. Interior fiber cement panelized cladding system and accessories.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to the work of this Section.

B. Section 05400 – Cold Formed Metal Framing

C. Section 06100 - Rough Carpentry

D. Section 07212 – Board and Batt Insulation

E. Section 07620 – Sheet Metal Flashing and Trim

F. Section 07900 - Joint Sealers

1.03 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 509-09 – Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems

B. ASTM International (ASTM):
   1. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   2. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber Cement.
      a. ASTM C 1186 – Standard Specification for Flat Fiber-Cement Sheets.
   3. ASTM E-84 - Standard Test for Surface Burning Characteristics of Building Materials.
   4. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   5. ASTM E 228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
   6. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   7. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   8. ASTM G 23 - Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials, Replaced by G152 and G153.

C. Florida Building Code - Test Protocol HVHZ:
   1. Testing Application Standard (TAS) 201, 202, 203 – Impact Test Procedures.

D. National Fire Protection Association (NFPA):
   1. NFPA 285 - Fire Test Method for Exterior Wall Assemblies Containing Combustible Material.
   2. NFPA 268 – Ignition Resistance of Exterior Wall Assemblies.

E. Standards Council of Canada & Underwriters Laboratories Canada (ULC):
   1. CAN/ULC S-134 – Standard Method of Fire Test of Exterior Wall Assembly.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Submit manufacturer’s product description, storage and handling requirements, and installation instructions.

C. Product Test Reports and Code Compliance: Documents demonstrating product compliance with local building code, such as test reports or Evaluation Reports from qualified, independent testing agencies.

D. Manufacturer's Details: Submit drawings (.dwg, .rvt, and/or .pdf formats), including plans, sections, showing installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.

E. Samples: Submit samples of each product type proposed for use.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. All fiber cement panels specified in this section must be supplied by a manufacturer with a minimum of 10 years of experience in fabricating and supplying fiber cement cladding systems.
      a. Products covered under this section are to be manufactured in an ISO 9001 certified facility.
   2. Provide technical and design support as needed regarding installation requirements and warranty compliance provisions.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained by manufacturer or representative.

C. Mock-Up: Include Composite Wall Panels in Mock-Up as described in Section 01 4000 Quality Requirements.

D. Pre-Installation Meetings: Prior to beginning installation, conduct conference to verify and discuss substrate conditions, manufacturer's installation instructions and warranty requirements, and project requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation.

B. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty.

C. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.

D. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

1.07 WARRANTY

A. Provide manufacturer's 50-year warranty against manufactured defects in fiber cement panels.

B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish.

C. Warranty provides for the original purchaser. See warranty for detailed information on terms, conditions and limitations.

PART 2: PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Nichiha Corporation, 18-19 Nishiki 2-chome Naka-ku, Nagoya, Aichi 460-8610, Japan. www.nichiha.com. Manufacturer's Representative: Nichiha USA, Inc., 6465 E. Johns Crossing, Suite 250, Johns Creek, GA 30097. Toll free: 1.866.424.4421, Office: 770.805.9466, Fax: 770.805.9467
   1. Typical Fiber Cement Cladding 1 and 2:
      a. Basis of Design Product: Nichiha Natura
      b. Profile colors: To be selected by the Architect from manufacturer's full range of colors.
      c. Accessory/Component Options:
         1) Manufactured Corners with 3-1/2" returns in profile colors.
         2) Aluminum trim to be painted per finish schedule: Outside corners (Corner Key, Open Outside Corner), vertical joints (Bead Reveal, H-Mold), terminations (J-Mold, L-Mold)
         3) Essential Flashing System: Starter, Compression Joint, Overhang.
      d. Dimensions: Nominal - 18" (h) x 10' (l);

1) Actual - 455mm (h) x 3,030 mm (l).
e. Panel Thickness: 5/8 inch (16 mm actual).
f. Finish: To be selected by the Architect from manufacturer's full range.
g. Weight: 57.32 lbs. per panel.
h. Coverage: 15 sq. ft. per panel.
i. Factory sealed on six [6] sides.

2. Typical Fiber Cement Cladding 3:
a. Basis of Design Product: Nichiha Illumination
b. Profile colors: To be selected by the Architect from manufacturer's full range of colors.
c. Accessory/Component Options:
1) Manufactured Corners with 3-1/2" returns in profile colors.
2) Aluminum trim to be painted per finish schedule: Outside corners (Corner Key, Open Outside Corner), vertical joints (Bead Reveal, H-Mold), terminations (J-Mold, L-Mold)
3) Essential Flashing System: Starter, Compression Joint, Overhang.
d. Dimensions: Nominal - 18" (h) x 10' (l);
1) Actual - 455mm (h) x 3,030 mm (l).
e. Panel Thickness: 5/8 inch (16 mm actual).
f. Finish: To be selected by the Architect from manufacturer's full range.
g. Weight: 57.32 lbs. per panel.
h. Coverage: 15 sq. ft. per panel.
i. Factory sealed on six [6] sides.

B. Other Manufacturer: American Fiber Cement Corporation (AFCC): www.americanfibercement.com.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 MATERIALS

A. Fiber cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles.

B. Panel surface pre-finished and machine applied.

C. Panels profiled along all four edges, such that both horizontal and vertical joints between the installed panels are ship-lapped.

D. Factory-applied sealant gasket added to top and right panel edges; all joints contain a factory sealant.

2.03 PERFORMANCE REQUIREMENTS:

2.04

A. Fiber Cement Cladding – Must comply with ASTM C-1186, Type A requirements:
1. Linear Variation with Change in Moisture Content: 0.17% linear change.
2. Wet Flexural Strength, lower limit: 580 psi.
3. Water Tightness: No water droplets observed on any specimen.
4. Freeze-thaw: No damage or defects observed.
5. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.
6. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.

B. Mean Coefficient of Linear Thermal Expansion (ASTM E-228): Max 1.0*10^-5 in./in. F.

C. Surface Burning (((UL 723))/ASTM E-84): Flame Spread: 0, Smoke Developed: 5.

D. Wind Load (ASTM E-330): Contact manufacturer for ultimate test pressure data corresponding to framing type, dimensions, fastener type, and attachment clips. Project engineer(s) must determine Zone 4 and 5 design pressures based on project specifics.

E. Minimum lateral deflection: L/120.

F. Water Penetration (ASTM E-331): No water leakage observed into wall cavity.

G. Weather Resistant (ASTM G-23): No cracking, checking, crazing, erosion, or other detrimental effects observed.

H. Steady-State Heat Flux and Thermal Transmission Properties Test (ASTM C-518): thermal resistance R Value of 1.23.

I. Fire Resistant (ASTM E-119): The wall assembly must successfully endure 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.

J. Ignition Resistance (((NFPA 268))): No sustained flaming of panels, assembly when subjected to a minimum radiant heat flux of 12.5 kW/m2 ± 5% in the presence of a pilot ignition source for a 20-minute period.

K. Fire Propagation (NFPA 285): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Commercial Wrap, ½" Densglass Gold Sheathing, 16" o.c. 18 gauge steel studs, mineral wool in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of NFPA 285.

L. Fire Propagation (CAN/ULC S-134): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Housewrap, 5/8" FRT plywood, 16" o.c. 2x wood studs, fiberglass in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of CAN/ULC S-134.

M. Drained and Back Ventilated Rainscreen (((AAMA 509))-09): System must pass all component tests.

N. Florida Building Code - Test Protocol HVHZ (TAS 201, 202, 203): Passed.

2.05 INSTALLATION COMPONENTS

A. Reference Specification Section 07 4210 Composite Framing Supports:
   1. Typical Fiber Cement Cladding 1 Framing Support Depth: 4", or as required to match insulation depth indicated in Drawings.
   2. Typical Fiber Cement Cladding 2 Framing Support Depth: 2", or as required to match insulation depth indicated in Drawings.
   3. Typical Fiber Cement Cladding 3 Framing Support Depth: 2", or as required to match insulation depth indicated in Drawings.

B. Aluminum Trim: To be selected by the Architect from manufacturer's full range of colors.

C. Essential Flashing System (optional):
   1. Starter – main segments (3030mm), inside corners, outside corners
   2. Compression Joint – main segments (3030mm)
   3. Overhang – main segments (3030mm), inside corners, outside corners, joint clips

D. Fasteners: Corrosion resistant fasteners, such as hot-dipped galvanized screws appropriate to local building codes and practices must be used.

E. Flashing: Flash all areas specified in manufacturer's instructions. Do not use raw aluminum flashing. Flashing must be galvanized, anodized, or PVC coated.

F. Sealant: Sealant shall be polyurethane, or hybrid, and comply with ASTM C920.

PART 3: EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Fiber cement panels can be installed over braced wood, steel studs and sheathing including plywood, OSB, plastic foam or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's) and Concrete Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction.
   2. Allowable stud spacing: See manufacturer's installation instructions for details.
   3. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier (WRB) as defined by the 2015 IBC. Refer to local building codes.
   4. Appropriate metal flashing should be used to prevent moisture penetration around all doors, windows, wall bottoms, material transitions and penetrations. Refer to local building codes for best practices.

B. Examine site to ensure substrate conditions are within specification for proper installation.

C. Do not begin installation until unacceptable conditions have been corrected.

D. Do not install panels or components that appear to be damaged or defective. Do not install wet panels.

3.02 INSTALLATION

A. General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation.
   1. Consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building higher than 45 feet or three stories. Special installation conditions may be required via a Technical Review and Special Applications Form process.
   2. Vertical Control/Expansion Joints and/or Horizontal/Compression Joints may be required. Refer to installation guide(s).

B. Panel Cutting
   1. Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area.
   2. Always wear safety glasses and NIOSH/OSHA approved respirator whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer SDS for more information.
   3. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade.
      a. Recommended circular saw: Makita 7-1/4” Circular Saw with Dust Collector (#5057KB).
      b. Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505).
      c. Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork.
   4. Silica Dust Warning: Fiber cement products may contain some amounts of crystalline silica, a naturally occurring, potentially hazardous mineral when airborne in dust form. Consult product SDS or visit www.osha.gov/SLTC/silicacrystalline/index.html.

3.03 CLEANING AND MAINTENANCE

A. Review manufacturer guidelines for detailed care instructions.

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SECTION 07 5416
ETHYLENE INTERPOLYMER (KEE) ROOFING

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:
   1. Adhered ethylene interpolyemer (KEE) roofing system.
   2. Vapor retarder.
   3. Roof insulation.
   4. Pedestal-supported plaza deck pavers.

B. Section includes the installation of insulation strips in ribs of deck. Insulation strips are furnished under Section 05 3100 "Steel Decking."

C. Related Requirements:
   1. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing and counterflashing installation and requirements, including termination bar.
   2. Section 07 9010 Joint Sealers: for joint sealants, joint fillers, and joint preparation.

1.03 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.04 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacings and patterns for mechanically fastened roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:
1. Sheet roofing, of color required.
2. Walkway pads or rolls, of color required.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Mock-Up: Provide an in-place mock-up of 100 sq. ft. See Section 01 4000 - Quality Requirements for mock-up guidelines.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Provide all necessary roof, and related, components to achieve specified warranty.

B. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and other components of roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

C. Special Project Warranty: Submit roofing Installer's 5-year workmanship warranty, on Roofing Guarantee form in the "General Conditions" Section of the Project Manual, signed by Installer, covering the Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products.

D. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Johns Manville: www.jm.com

B. Siplast: www.siplast.com

C. Carsile: www.carlislesyntec.com

D. Garland: www.garlandco.com

E. Source Limitations: Obtain components including roof insulation, fasteners, and vapor barrier for roofing system from manufacturer approved by membrane roofing manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
   1. Fire/Windstorm Classification: Class 1A-90.
   2. Hail-Resistance Rating: SH.

D. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.03 KEE ROOFING

A. KEE Sheet: ASTM D 6754/D 6754M, fabric reinforced.
   1. Thickness: 45 mils nominal.
   2. Exposed Face Color: White.

2.04 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as KEE sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.05 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.06 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
   2. Adhesive: Manufacturer's standard lap adhesive, FM Global approved for vapor-retarder application.

B. Laminated Sheet: Polyethylene laminate, two layers, reinforced with cord grid, with maximum permeance rating of 0.06 perm.
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.07 ROOF INSULATION

A. General: Preformed roof insulation boards or approved by KEE roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

E. Roof Insulation, provide R-30.

2.08 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation[and cover boards] to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
1. Modified asphaltic, asbestos-free, cold-applied adhesive.
2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
3. Full-spread spray-applied, low-rise, two-component urethane adhesive.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch.

2.09 PIPE SUPPORTS

A. Pipe Supports: Polycarbonate resin roller and rod situated in polycarbonate resin seat, designed to support roof-mounted mechanical piping, allowing for thermal expansion and contraction of pipes. Provide with non-corrosive pipe strap.
1. Miro Industries, Inc.; Model 3-R-2 [Basis of Design]: www.miroind.com.
2. PHP Systems: www.phpsd.com
3. ASC Engineered Solutions: asc-es.com

2.10 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 3100 "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

3.03 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary

seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

D. Roof insulation attachment.
   1. At metal decking, mechanically fasten first layer of insulation and adhere subsequent layers.
   2. At concrete, adhere first layer of insulation and fully adhere subsequent layers.

3.04 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
   2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.05 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively. Continuously seal side and end laps with tape adhesive.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.06 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

H. See ROOFING INSTALLATION, GENERAL (3.03 D.) for general fastening requirements for insulation.

I. Loosely Laid Insulation: Loosely lay insulation units over substrate.

J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.
   1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.07 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before installing.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.08 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.09 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway surrounding mechanical equipment. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075416

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Self-Adhered Membrane Flashing.

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 01 4000 - Quality Requirements: General requirements for mock-ups.

C. Section 04 2000 - Unit Masonry Assemblies: Through-wall flashings in masonry.

D. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

E. Section 07 1300 - Sheet Waterproofing: Termination bar specified herein used.

F. Section 07 3113 - As phal: Shingle roofing and related flashings, other than underlayment specified in this Section.

G. Division 7 Membrane Roofing Sections: Termination bar specifed herein used at membrane roofing turning up vertical surfaces.

H. Section 07 5400 - Thermoplastic Membrane Roofing: Roofing system.

I. Section 07 5416 Ethylene Interpolymer [KEE] Roofing

J. Section 07 7100 - Ro ofSp: Manufactured copingsand manufactured expansion joint covers, and roof edge flashings.

K. Section 07 7123 - Manufactured Gutters and Downspouts.

L. Section 07910 - Joint Sealers.

M. Section 09 9100 - Painting: Field painting.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. CDA A4050 - Copper in Architecture - Handbook; current edition.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 8 by 10 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

C. Single-Source Responsibility: Self-adhering flashings at rough openings shall be manufactured by manufacturer of water/air barrier coating specified in Section 07 1400 - Fluid-Applied Air Barrier, for material compatibility and single-source manufacturing responsibility.

D. Coordination with Metal Roof Panels: Coordinate product selection of self-adhered membrane flashing used for underlayment at metal roof, with metal roofing supplier to assure compatibility.

E. Mock-Up: Include Sheet Metal Flashing and Trim in mock-up as described in Section 01 4000 - Quality Requirements.

1.06 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 SHEET MATERIALS

A. Aluminum-zinc alloy coated steel sheet ("Galvalume") conforming to ASTM A792/ A 792M; minimum AZ50 coating, with minimum 50,000 p.s.i. yield.
   1. Finish: 3-coat full strength (70-percent) Kynar 500 resin (20 year) finish.
      a. Color: As selected by Architect from Manufacturer's full range of preimum colors.
   2. Thickness: minimum 24-gauge.

B. Self-Adhering Flashing - Around Windows, Doors, and Critical Wall Penetrations: Self-adhesive, rubberized asphalt bonded to polyethylene film, cold applied tape, with silicone-coated release sheet; 40 mil thickness; 12" wide roll, or as required. Provide primer when recommended by flashing manufacturer.
   1. Carlisle Coatings & Waterproofing, Inc.; CCW-705-TWF, : www.carlisle-ccw.com.
   2. Grace, W. R. & Co.; Perm-A-Barrier Wall Flashing: www.na.graceconstruction.com.
   3. Tremco, ExoAir 110: www.tremcosealants.com.
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Sealant: Type specified in Section 07 9010.

B. Termination Bar: Stainless steel bar designed to terminate and seal top or edge of flashing on vertical surfaces. Bar shall be flat and shall have pre-drilled holes 8" o.c. for attachment to substrate with appropriate non-corrosive fasteners. Bar shall be 3/4" wide by 1/8" thick.
   1. Termination bar shall be encapsulated with compatible sealant. Note: The sealant shall be compatible with the water/air barrier coating, and shall be compatible with the waterproofing membrane and adhesives. (Acrylic latex sealant shall NOT be used.)

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; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 SELF-ADHERED MEMBRANE FLASHING

A. Self-Adhered Membrane Flashing: Used as underlayment under Shingle Roofs and Metal Siding (Occuring Over Solid Substrates): Self-Adhering, Rubberized Asphalt bonded to Polyethylene-Film, 40 mils (1.0 mm) thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer. Thermal stability: Unaffected at -20 deg. F.; ASTM D 1970.
   1. Carlisle Coatings & Waterproofing, Inc.; Dri-Start "A": www.carlisle-ccw.com.
   2. Grace, W. R. & Co.; Ice and Water Shield [Basis of Design]: www.na.graceconstruction.com.
   3. Johns Manville International, Inc.; Roof Defender: www.jm.com.

4. Owens Corning; WeatherLock Flex: www.owenscorning.com.

B. Self-Adhered Membrane Flashing - High Temperature: Used as underlayment under Metal Roof or horizontal applications of metal (Occuring Over Solid Substrates): Provide primer recommended by underlayment manufacturer.
   1. Material: Slip-resisting top surface laminated to layer of rubberized asphalt adhesive, with disposable release sheet. Self-adhering, cold-applied.
   2. Thermal stability: Stable after testing at 240 deg. F. (ASTM D1204); and flexibility unaffected at -20 deg. F. (ASTM D1970).
   3. Weight: 0.22 pounds/sq. ft., installed.
   4. Permeance: 0.05 perms maximum (ASTM E96).
   5. Exposure: Can be left exposed maximum of 120 days from date of installation per ASTM G90 - EMMAqua test.
   6. Thickness: 40 mils thick, minimum.
   7. Manufacturers/Product:
      a. Carlisle Coatings & Waterproofing, Inc., : www.carlisle-ccw.com.
      b. CertainTeed Corporation: www.certainteed.com.
      c. Grace, W.R. & Co.; "Ice and Water Shield HT" [Basis of Design]: www.na.graceconstruction.com.
      d. Henry Company: www.henry.com.

C. Install 1-layer over substrate surface at the following locations:
   1. 36-inches wide in all valleys, over all hips and ridges (18-inches on each side of each valley, hip ridge, and top ridge), and at perimeter edges of shingle roof planes.
   2. Below all metal roofing, and behind any non-insulated metal wall panels and metal siding.
   3. Where roofing planes intersect vertical walls and planes, turn edges up at least 8-inches.
   4. Cover sheathing at corners.
   5. Wrap head, jambs, and sill of all punched openings.

D. Coordinate with, and refer to Division 7 Roofing and Siding Sections for additional information and requirements.

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. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

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. Seal metal joints watertight.

E. Install continuous through-wall flashing and sub-sill flashing with interior end dam prior to setting doors and windows. Typical at head and sill conditions. Jamb flashing to terminate in sub-sill flashing. Install metal head flashing at all window and door heads per manufacturer's standard detail.

F. Where sloping roof abutts a wall, integrate metal step flashing into the shingle roofing in accordance with best industry standards to provide weathertight joint.

G. Apply Self-Adhered Membrane Flashing used as underlayment in accordance with manufacturer's recommendations.

1. Lap in shingled manner.
2. Flash perimeter of wall openings.
3. Cover internal and external corners with additional layer of self-adhered membrane flashing.

H. Apply self-adhered flashing in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 07 7100
ROOF SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including roof edge flashings, scuppers.

B. Roof guardrail system.

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 06 1000 - Rough Carpentry.

C. Section 07 5416 - Ethylene Interpolymer [KEE] Roofing.

D. Section 07 7123 - Manufactured Gutters and Downspouts.

E. Section 07 7200 - Ro ofAc: Manufactured roof hatches.

F. Section 07 9010 - Jo intS.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. NRCA (RM) - The NRCA Roofing Manual; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, installation instructions, available profiles, textures, colors, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two samples of coping, and fascia, 12 inch long, x actual width, illustrating component shape, finish, for color selection.

E. Samples: Submit two appropriately sized samples of fascia, and coping and roof edge flashings, for color verification.

F. Roof Guardrail Color Samples: Submit colors available for Roof Guardrail System, for selection. Submit verification samples of selected color, for approval.

G. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of experience.
   1. Engage an experienced installer who has completed coping installations similar in materials, design, and extent to that indicated for project, that has resulted in construction with a record of successful service and performance.

B. Source limitations for system of accessories: Obtain each color, texture, pattern, and type of coping, and related accessories from one source, with resources to provide products of consistent quality in appearance and physical properties without delaying the work.

C. Mock-Up:
   1. Include Roof Specialties in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to Project site in manufacturer’s unopened packages or bundles with labels intact.

B. Store materials in a dry, well-ventilated, weathertight place. Do not store even temporarily on the ground. Comply with manufacturer's written instructions for storage, handling, and protection.
   1. Refer to Division 1 Sections "Summary of Work" and "Special Conditions", for additional information and requirements regarding stored materials.

1.07 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with roof specialty system installation only if existing and forecasted weather conditions permit the systems to be installed according to manufacturer's current written instructions and if substrate is completely dry.

1.08 WARRANTY:

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Project Warranty: Submit a written warranty, executed by roof specialty system manufacturer, agreeing to repair or replace coping and related trim systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 color-difference units as measured according to ASTM D 2244.
   1. Warranty Period: 20 years from date of Substantial Completion.

1.09 EXTRA MATERIALS:

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Furnish full lengths of coping system and related trim in a quantity equal to at least 2 percent of amount installed, in whole and unopened packages.

PART 2 - PRODUCTS

2.01 COMPONENTS

A. Scuppers: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration:
      a. Fabricate scuppers as detailed and in accordance with SMACNA Manual.
   2. Material: Pre-Finished Aluminum-zinc alloy coated steel: ASTM A 792, 55% Aluminum, 43.5% Zinc, 1.5% Silicon Coating ("Galvalume"), with minimum 50,000 p.s.i. yield.
      a. Finish: 3-coat full strength (70-percent) Kynar 500 resin (20 year) finish.
         1) Color: As selected by Architect from Manufacturer's full range of colors.
      b. Thickness: 22 gage, 0.03 inch thick, minimum.
      c. Primer: Zinc molybdate type.

2.02 ACCESSORIES

A. Sealant: Type As specified in Section 07 9010.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that deck, vapor/moisture barrier completion, water-tightness, installation tolerances, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

B. Examine substrates for compliance with requirements for substrates.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

3.03 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION

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SECTION 07 7200
ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Equipment rails.

C. Roof penetrations mounting curbs.

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 5416 - Ethylene Interpolymer [KEE] Roofing: Flat Roof.

C. Section 07 7100 - Roof Specialties: Other manufactured roof specialty items.

D. Section 08 3100 - Access Doors and Panels: Attic Hatch.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

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 01 7800 - Closeout Submittals for additional warranty requirements.

B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of flat roof deck sheathing with insulation.
   2. Sheet Metal Material:
   3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gauge, 0.048 inch thick.
   4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches.
   5. Provide layouts and configurations indicated on drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Finished Roof Surface: 8 inches, minimum above finished roof surface.

C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.

D. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.

2.02 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION

A. Roof Hatch Manufacturers:
1. Babcock-Davis; ThermalMAX: www.babcockdavis.com/#sle.
2. Bilco Company: www.bilco.com.
3. Nystrom: www.nystrom.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
1. Style: Provide flat metal covers unless otherwise indicated.
2. Fire-Rated.
3. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch thick.
2. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
3. Curb Height: As indicated on drawings.

D. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch thick, liner 0.04 inch thick.
3. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
4. Gasket: Neoprene, continuous around cover perimeter.

E. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.

2.03 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
1. Design Loadings and Configurations: As required by applicable codes.
2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

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.

END OF SECTION

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SECTION 07 8400
FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Work described in this Section includes:
   1. Through penetration firestopping in fire rated construction.
   2. Construction-gap firestopping at connections of the same materials and different materials in fire rated construction.
   3. Construction-gap fire stopping occurring within fire rated wall, floor, floor-ceiling, and/or roof-ceiling assemblies.
   4. Construction-gap firestopping at the top of fire rated walls.
   5. Through-penetration smoke-stopping in smoke partitions.
   6. Construction-gap smoke-stopping in smoke partitions.

B. Related work Specified elsewhere includes:
   1. For structural, finish, and fire protection materials: Refer to the appropriate Specifications Sections.
   2. Fire dampers and manufactured devices: Refer to Divisions 21-23.
   3. Raceway seals and manufactured electrical devices: Refer to Division 26.

C. Unless specifically indicated otherwise, the party, trade, or subcontractor whose work penetrates fire-rated construction and/or fire-rated assemblies, shall be responsible for firestopping around their own penetrations.

D. In the event the General Contractor employs a Specialty Subcontractor for the required firestopping work, they shall notify all prospective Bidders, so as to avoid duplication in pricing.
   1. The Specialty Subcontractor shall provide coordination of requirements and the related work of other trades in advance of and as the Work progresses.

1.03 REFERENCED STANDARDS

A. Underwriters Laboratories - U.L. Fire Resistant Directory:
   1. Through-penetration fire stop devices (XHCR); Firestop Devices (XHJI).
   2. Fire resistant ratings (BXUV) (BXRH).
   3. Through-penetration firestop systems (XHEZ).
   4. Fill, void, or cavity material (XHHW).
   5. Joint Systems (XHBN) & Perimeter Fire Containment Systems (XHDG).

B. American Society for Testing and Materials Standards:
   1. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
   2. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E 1966: Standard Test Method for Fire Resistive Joints Systems.
   4. ASTM E 2307: (Perimeter).

C. Underwriters Laboratories, Inc.:
   1. UL 1479: Fire Tests of Through-Penetration Firestops.
   2. UL 2079: Tests for Fire Resistance of Building Joint Systems.
   3. UL 723: Surface Burning Characteristics of Building Materials.

D. NFPA 101 - Life Safety Code / NFPA 70 - National Electrical Code.

1.04 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, smoke barrier walls, time rated floor-ceiling and roof-ceiling assemblies, and structural floors and walls.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses, and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.

F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc., to close specific barrier penetrations.

G. Sleeve: Metal fabrication or metal pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.05 SYSTEM DESCRIPTION

A. Design Requirements:
1. Fire Rated Construction: Maintain barrier and structural floor fire ratings including resistance to cold smoke at all penetrations, connections with other surfaces and/or types of construction, at separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.
2. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.

1.06 SUBMITTALS

A. Submit in accordance with General Conditions, and Division 1, unless specifically indicated otherwise.

B. Product Data: Manufacturer's written specifications and technical data including the following:
1. Detailed specifications of construction and fabrication.
2. Manufacturer's current written installation instructions.
3. Summary of test data for each product intended for use and limitations. Include name and address of the required independent testing laboratory and compliances obtained.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
1. Details of each proposed assembly identifying intended products and applicable UL System number or UL Classified devices.
2. Manufacturer or manufacturers representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.

D. Quality Control Submittals: Statement of qualifications.

E. Applicators' Qualifications Statement: List past projects indicating required experience.

1.07 QUALITY ASSURANCE

A. Specialty Contractor's Qualifications: Firm experience in installation or application of systems similar in complexity to those required for this project, plus the following:
1. Acceptable to or licensed by manufacturer, and to State, Local, and/or other authority having jurisdiction, where applicable.
2. At least 2-years experience with systems intended for use.
3. Successfully completed at least five projects of similar size, scope, and complexity using the systems intended for use.

B. Local and State Regulatory Requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System Numbers or UL classified devices and/or systems. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.08 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping:
   1. Deliver products in original unopened packaging with legible manufacturer's identification.
   2. Coordinate delivery with scheduled installation date, so as to allow minimum storage at site.

B. Storage and Protection: Store materials in a clean, dry, ventilated interior location. Store materials off of floor, and protect from soiling, abuse, moisture, and freezing. Follow manufacturer's written instructions when more stringent.

C. Remove damaged and/or contaminated materials immediately, legally dispose of off site, and Replace, at Contractor's expense.

1.09 PROJECT CONDITIONS

A. Existing Conditions:
   1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding with work.
   2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

B. Environmental Requirements:
   1. Furnish adequate ventilation if using solvents.
   2. Furnish forced air ventilation during installation if required by manufacturer and/or authorities having jurisdiction.
   3. Keep Flammable materials away from sparks or flame.
   4. Provide masking or drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
   5. Comply with manufacturer's written recommendations for temperature and humidity conditions before, during, and after installation of firestopping.

1.10 GUARANTEE

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasive resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, and/or general durability, and/or which appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality or characteristic of the material for the exposure indicated. The guarantee period shall be for 1-year from the date of "Substantial Completion."

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Use only those listed in the UL Fire Resistance Directory for the UL System involved.

B. Products shall be as manufactured by one of the following , or pre-approved equivalent:
   1. Dow Corning.
   2. HILTI.
   3. 3M Fire Protection Products.
   4. Nelson Firestop Products.
   5. Rector Seal Corp.; "Bio Fireshield", "Biostop", "Biotherm", "Metacaulk", "Track-Safe", [Basis of Design]: www.rectorseal.com.
   6. Specified Technologies, Inc.
   7. Tremco, Div. of RPM Corporation.

C. All firestopping products must be from a single manufacturer.

D. All trades shall use products from the same manufacturer.

2.02 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR (XHJI) and XHEZ may be used, providing that they conform to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designated to perform this function.

2.03 CONSTRUCTION-GAP FIRE STOPPING OF FIRE-RATED CONSTRUCTION

A. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.

B. Firestopping at construction gaps between tops of partitions and under side of structural systems.

C. Firestopping at construction gaps between tops of partitions and underside of fire-rated ceiling or ceiling assembly.

D. Firestopping of control joints in fire rated masonry partitions.

E. Firestopping expansion joints.

F. Acceptable manufacturers and products: Use only those listed in the UL Fire Resistant Directory for the UL System involved.

2.04 SMOKE STOPPING AT SMOKE PARTITIONS

A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded, as applicable.

B. Construction-gap smoke-stopping: Any system complying with the requirement for construction-gap firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide the smoke seal. The length of time of the fire resistance may be disregarded, as applicable.

2.05 ACCESSORIES

A. Fill, void, and cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.

B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Notify the General Contractor of such conditions.
   1. Verify barrier penetrations are properly sized and in suitable conditions for application of materials.
   2. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 PREPARATION AND CLEANING

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances, that may effect proper fitting, adhesion, or the required fire resistance.

3.03 INSTALLATION

A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's written instructions and recommendations.

B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

C. Where floor openings without penetrating items are more than 4-inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as required for floor system.

D. Protect materials from damage on surfaces subject to traffic.

E. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges, which are to be installed in accordance with fire damper manufacturer's written recommendations, unless specifically indicated otherwise.

F. Where large openings are created in walls, or floors to permit installation of pipes, ducts, cable tray, bus duct, or other items, close unused portions of opening with firestopping material tested for the application.

G. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12-inch wide fiber dams for full thickness and height of air cavity at maximum intervals of 15'-0" on center.

3.04 FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by the Architect, building inspector, fire inspector, and/or other authority having jurisdiction.

C. Perform under this Section patching and repairing of firestopping caused by cutting or penetration by other trades, and/or by any other cause.

3.05 ADJUSTING AND CLEANING

A. Immediately clean-up spills of liquid components.

B. Neatly cut and trim materials as required.

C. Remove equipment, materials and debris, leaving area in undamaged and clean condition.

D. Legally dispose of excess materials, trash, debris, etc., off of site.

END OF SECTION

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SECTION 07 9010
JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Exterior Silicone and Polyurethane Sealants.
2. Exterior and Interior Polyurethane Traffic Sealants.
3. Interior Silicone and Polyurethane Sealants.
4. Interior Latex Joint Sealers.
5. Metal lap joint sealants.
6. Threshold and sheet metal bedding sealants.
7. Acoustic Sealant.
8. Joint Accessories.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:
1. Section 01400 - Quality Requirements: General requirements for mock-ups.
2. Section 03 3000 - Concrete.
3. Section 04 2000 - Unit Masonry Assemblies.
4. Section 07 1400 - Fluid-Applied Air Barrier: Sealants required in conjunction with substrates for fluid-applied waterproofing.
5. Section 07 6200 - Sheet Metal Flashing and Trim.
6. Division 8 - Doors and Windows.
7. Section 08 8000 - Glazing: Glazing sealants and protective glazing systems.
8. Section 09 2116 - Gypsum Board Assemblies.
9. Section 09 3000 - Tile.
10. Section 09 5100 - Suspended Acoustical Ceilings.
11. Section 09 9100 - Paints and Coatings.
12. Divisions 15 and 16 - (Joint sealers for mechanical and electrical work)

1.03 REFERENCE STANDARDS

A. ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.

B. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).

C. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

D. ASTM C834 - Standard Specification for Latex Sealants.

E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.

F. ASTM C 1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

G. ASTM C 1193 - Standard Guide for Use of Joint Sealants.

H. ASTM C 1247 - Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.

I. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.

J. ASTM C 1311 - Standard Specification for Solvent Release Sealants.

K. ASTM D 2203 - Standard Test Method for Staining from Sealants.

1.04 DESCRIPTION OF WORK

A. Work described in this section includes joint sealer systems.

1.05 SYSTEM PERFORMANCES

A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's complete product specifications, handling/installation/curing instructions, color charts and performance tested data sheets and field / lab results for each product required.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Engage an Installer who has successfully completed within the last three years at least 3 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.

B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

C. Mock-Up:
   1. As indicated on drawings.
   2. Coordinate with work of other Sections.
   3. Locate where directed.
   4. Mock-up may not remain as part of the Work.

1.08 DELIVER, STORAGE AND HANDLING

A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.

B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.09 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 degrees F.
   2. When joint substrates are wet due to rain, frost, condensation or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.

B. Colors: Provide color of exposed joint sealers indicated, or if not indicated, as selected by Architect from manufacturer's full range of custom colors.

2.02 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

B. Multi-Part Nonsag Urethane Sealant: Type M, Grade NS, Class 25, Uses NT, M, A and, as applicable to joint substrates indicated, O.
   1. Products: Subject to compliance with requirements, provide one of the following:

a. "Dynatrol 11" One-part; Pecora Corp.
b. "Sonolastic NP-2" Multi-component; Sonneborn.
c. "Dymeric 240/240FC" Multi-component; Tremco, Inc.

2. Locations for Use: Exterior joints and penetrations in vertical surfaces of concrete, and between metal and concrete, mortar or stone; overhead or ceiling joints; perimeters of metal frames in exterior walls; vertical expansion and control joints in masonry and concrete; and at all miscellaneous locations requiring a joint sealant.
3. Equivalent 1-part sealants will be acceptable for interior surfaces only, by one of the above named manufacturers.

C. Two-Part Pourable Urethane Sealant (Horizontal): Type M, Grade P, Class 25; Uses T, M, A and, as applicable to joint substrates indicated, O.
1. Products: Subject to compliance with requirements, provide one of the following:
a. "Vulkem 45SSL"; Tremco, Inc.
b. "Pourthane"; W. R. Meadows, Inc.
c. "NR-200 Urexpan"; Pecora Corp.
d. "Sonolastic Paving Joint Sealant"; BASF Building Products Div.,
e. "THC-900/901"; Tremco, Inc.
2. Locations for Use: Exterior and interior expansion, control and construction joints in horizontal surfaces; and joints subject to pedestrian and light vehicular traffic.
3. Equivalent 1-part sealants will be acceptable for joints in exterior concrete paving only by one of the above named manufacturers.

D. One-Part Mildew-Resistant Silicone Sealant: Type S, Grade NS; Class 25, Uses NT, G, A and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.
1. Products: Subject to compliance with requirements, provide one of the following:
a. "Dow-Corning 786"; Dow Corning Corp.
b. "SCS 1702"; General Electric.
c. "863 #345 White"; Pecora Corp.
d. "Tremsil 200"; White, Clear; Tremco, Inc.
2. Locations for Use: Interior joints in vertical surfaces and terminal edges of tile; showers, baths, and joints at damp areas, such as around sinks and plumbing fixtures and pipe penetrations; and exposed terminal edges of vinyl flooring, such as around door frames and terminations at concrete.

E. Pre-Compressed Polyurethane Foam Sealant: Tremco "illmod 600": Expandable sealant for use between CMU wall and a floor slab, and at other similar locations or where noted. Color: black.

F. Expansion (High Movement) Joint Sealants: One part, neutral cure silicone material: Dow Corning 790 Silicone Building Sealant, or Tremco, Inc. Spectrem 1, Spectrem 3, Spectrem 4 TS (Tintable System). Type S, Grade NS, Class +/- 50. Uses NT, M, G, O.

G. Masonry:
1. Silicone, non-staining, neutral curing:
a. "Spectrem 1", "Spectrem 3", or "Spectrem 4-TS" - Tintable System; Tremco, Inc.
b. Dow "790".
c. Pecora "890".

2.03 LATEX JOINT SEALERS

A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part nonsag, acrylic, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than + 7.5%.
1. Products: Subject to compliance with requirements, provide with one of the following:
a. "Chem-Calk 600"; Bostik Construction Products Div.
b. "AC-20"; Pecora Corp.
c. "Sonolac"; Sonneborn Building Products Div; Rexnord Chemical Prod., Inc.
d. "Tremflex 834"; Tremco Inc.

2. Locations for Use: Interior joints in field-painted vertical and overhead surfaces at perimeter of metal door frames, gypsum drywall, plaster and concrete or concrete masonry; and all other interior locations not indicated otherwise.

2.04 ACOUSTIC SEALANT

A. Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
   1. Applications: Use for concealed locations only:
      a. Sealant bead between top stud runner and structure and between bottom stud track and floor.

2.05 FIRE-RESISTANT JOINT SEALERS

A. Refer to Section 07 8400 - "Firestopping," for additional information and detailed requirements.

2.06 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint-Fillers:
   1. Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
   2. Backer Rod: Premium grade, closed cell polyethylene foam rod; Sealtight Backer Rod, as manufactured by W.R. Meadows, Inc., or approved equivalent.
   3. Joint Filler: "Ceramar" flexible foam expansion joint filler, as manufactured by W.R. Meadows, Inc., or approved equivalent.
      a. Thickness: 1/4".

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

2.07 MISCELLANEOUS MATERIALS

A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.

C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surface adjacent to joints.

D. Expansion Joint Filler: Multi-purpose, Expansion-Contraction Joint Filler for slab joints. Thickness: 1/2 inch, unless indicated otherwise. Equal to W.R.Meadows Fibre Expansion Joint.

PART 3 - EXECUTION

3.01 INSPECTION

A. Require Installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
   1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

D. Perform field sealant adhesion testing prior to beginning work to verify substrate preparation and priming requirements.

3.03 INSTALLATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

D. Installation of Sealant Backings:
1. Install sealant backings to comply with the following requirements:
2. Install joint-fillers of type indicated or recommended by sealant manufacturer to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
   a. Do not leave gaps between ends of joint-fillers.
   b. Do not stretch, twist, puncture or tear joint-fillers.
   c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
3. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

F. Perform acoustical sealant application work in accordance with ASTM C 919.

G. Tooling of Nonsag Sealants:
1. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
2. Concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.04 PROTECTION AND CLEANING

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged

or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION

SECTION 08 1113
STEEL 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. Accessories.

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 08 7100 - Door Hardware.

C. Section 09 9100 - Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).

N. ITS (DIR) - Directory of Listed Products; Current Edition.

O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

Q. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

V. UL (DIR) - Online Certifications Directory; Current Edition.

W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any. Show anchorage and accessory items.

D. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

E. Coordinate glazing frames and stops with glass and glazing requirements.

F. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

G. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

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. Provide doors and frames complying with Steel Door Institute “Recommended Specifications: Standard Steel Doors and Frames” (SDI-100) and as herein specified.

C. Provide steel doors and frames from a single manufacturer.

D. Fire-Rated Door Assemblies:
1. Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 “Standard for Fire Doors and Windows,” and have been tested, listed and labeled in accordance with ASTM E 152 “Standard Methods of Fire Tests of Door Assemblies” by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
2. Labels mounted on doors and door frames must indicate the time rating of the door/frame assembly.
3. Provide units listed and labeled by UL.
4. Attach fire rating label to each fire-rated unit.
5. Fire rating label must be accessible, permanent (embossed on metal label), and be kept legible at all times.
6. Labels on frames with transoms or sidelights must identify that the opening assembly includes same.

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.

C. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.

D. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equivalent in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

E. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames, (General):
   1. Ceco Door: www.cecodoor.com.
   2. Curries, Mason City, Iowa: www.curries.com.
   3. Mesker Industries, Inc.
   4. Republic Builders Products Corp./Subs. Republic Steel.

B. Substitutions: Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   3. 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.
   4. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Materials:
   1. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
   2. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM SA 568.
   3. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G90 zinc coating, mill phosphatized.
   4. Supports and Anchors: Fabricate of galvanized sheet steel of gage not less than that of door frame.
   5. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

C. Fabrication:
   1. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site.
   2. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
   3. Fabricate exterior doors, panels and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels.
      a. Use galvanizing repair paint for surfaces damaged by fabrication or welding.
   4. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
   5. Finish Hardware Preparation:
      a. Prepare doors and frames to receive mortise and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.
      b. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

c. Locate finish hardware as indicated on final shop drawings, or if not indicated, in accordance with "Recommended Locations for Builders' Hardware," published by Door and Hardware Institute.

6. Shop Painting:
   a. Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
   b. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.
   c. Use galvanizing repair paint for surfaces damaged by fabrication or welding, prior to prime coat.
   d. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
   e. Do not paint fire labels on doors or frames.

D. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Provide metal doors of types and styles indicated on drawings or schedules, or seamless hollow steel construction. Form exterior doors of hot dip galvanized steel.

B. Exterior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Core Material: Polystyrene, 1 lbs/cu ft minimum density.
   3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   4. Door Face Sheets: Flush.

C. Exterior Doors, Fire-Rated:
   1. Grade: ANSI A250.8 - SDI-100; Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 1 - Full Flush.
   2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
      a. Provide units listed and labeled by UL (Underwriters Laboratories) - UL (BMD).
      b. Attach fire rating label to each fire rated unit.
   3. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
   4. Core: Mineral board.
   5. Thickness: 1-3/4 inch.
   6. Top Closures : Flush with top of faces and edges.
   7. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
   8. Texture: Smooth faces.

D. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches, nominal.

E. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 2 - Heavy-duty.
b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.
c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   b. Attach fire rating label to each fire rated unit.
3. Core Material: Mineral board.
4. Door Thickness: 1-3/4 inches, nominal.

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. General:
   1. Comply with the requirements of grade specified for corresponding door, except:
      a. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricated frames of minimum 16-gauge cold-rolled furniture steel for interior door frames; 14-gauge cold-rolled furniture steel for exterior door frames.
         1) Frames for doors 7'-10" or more in height and/or over 3'-5" in width: 14 gauge cold-rolled furniture steel, and one additional hinge, whether or not indicated in hardware schedule.
   2. Frames shall be formed by press brake with corners sharp and true. Corners shall be mitered and accurately fitted, and shall be fully electrically welded and then ground smooth. Removable spreaders shall be welded to the bottom of the frame. Frames shall be accurately mortised for hardware.
   3. Contractor shall verify width of throat opening required, before fabrication.
   4. A minimum of three wall anchors shall be provided at each jamb, except four at doors 7'-10" high or more, and six at doors 10-foot high or more. Anchors shall be attached to door frames, adjustable, suitable for wall conditions and job requirements, and shall be 16 gauge minimum. Floor anchors shall be provided and welded to foot of each jamb with two 5/16" holes for securing to the floor.
   5. Reinforcements of adequate gauge shall be provided for strikes, closers and brackets and other surface applied hardware for field drilling and tapping.

C. Exterior Door Frames: Fully welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Finish: Factory primed and field finished.
   3. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames: Fully welded type.
   1. Frame Finish: Factory primed and field finished.

E. Interior Door Frames, Fire-Rated: Fully welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Finish: Factory primed and field finished.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As spec - Glazing.

B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
   1. Provide additional door silencers at doors over 3'-0" wide or 7'-0" in height.
   2. Provide silencers equivalent to "GJ64" silencers as manufactured by Glenn-Johnson Corp., for metal frames, when not provided under the work of Section 08 7100 - "Finish Hardware."

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

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. General: Install standard steel doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Placing Frames:
   1. Comply with provisions of SDI-1-06 “Recommended Erection Instructions for Steel Frames,” unless otherwise indicated.
   2. Remove before installation all spreader bars and braces used for shipping.
   3. Except for frames located at in-place concrete or masonry, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces leaving surfaces smooth and undamaged.
   4. In masonry construction, locate a minimum of 3 wall anchors per jamb at hinge and strike levels. Add 1 wall anchor per jamb at hinge and strike levels for each whole 1'-10" height increment over 6'-0"; Similar at glazed and cased openings.
   5. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
   6. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws. Add additional anchors as indicated in paragraphs above.
   7. Install fire-rated frames in accordance with NFPA Std. No. 80

G. Door Installation:
   1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
   2. Place fire-rated doors with clearances as specified in NFPA Std. No. 80.

H. Install silencers after all painting of doors and frames has been completed.

I. Install door hardware as specified in Section 08 7100.

J. Comply with glazing installation requirements of Section 08 8000.

K. Coordinate installation of electrical connections to electrical hardware items.

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 measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Prime Coat Touch-up:
   1. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
   2. Use galvanizing repair paint for galvanized surfaces, prior to prime coat.

C. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

D. Repair all dents, bends, and prying prior to painting.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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SECTION 08 1416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire rated and non-rated.

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 04 2000 - Unit Masonry: Masonry construction to receive door frames.

C. Section 06 2000 - Finish Carpentry: Wood trim and molding associated with flush wod doors.

D. Section 08 1113 - Steel Doors and Frames: Steel door frames to receive wood doors.

E. Section 08 4313 - Aluminum Framed Storefronts: Interior aluminum framed storefronts to receive wood doors.

F. Section 08 7100 - Finish Hardware.

G. Section 08 8000 - Glazing.

H. Section 09 2116 - Gypsum Board Assemblies: Framing and wall assemblies to receive door frames.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

C. ANSI A208.1 - American National Standard for Particleboard; 2022.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

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 C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

I. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings; 2023.

J. ASTM E413 - Classification for Rating Sound Insulation; 2022.

K. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.

L. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.

M. AWI (QCP) - Quality Certification Program; Current Edition.

N. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

O. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

P. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2022.

Q. FM (AG) - FM Approval Guide; Current Edition.

R. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. ITS (DIR) - Directory of Listed Products; Current Edition.

T. AWS (AWI/AWMAC/WI) Architectural Woodwork Standards, 2nd Edition; 2014.

U. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

V. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

W. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

X. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

Y. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

AA. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.

D. Samples: Submit two samples of stain colors, 6 x 6 inches minimum - on actual veneer chosen, for Architect to use to select stain color.

E. Verification Samples: Submit two samples of door veneer, minimum 24 x 24 inches in size illustrating wood grain, stain color, and sheen.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than FIVE (5) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five (5) years of documented experience.

C. Installed Fire-Rated Door Assembly: Comply with fire-rating as indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
1. Eggers Industries: www.eggersindustries.com/#sle.
2. Graham Wood Doors: www.grahamdoors.com.
3. Haley Brothers: www.haleybros.com/#sle.
4. Marshfield-Algoma: www.marshfielddoors.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. General: See drawings for locations and additional requirements.
   1. Quality Level: Premium Grade, Heavy Duty performance, in accordance with AWS, 2nd Edition, Section 9 - Doors.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with NFPA 252 or UL 10B - Negative (Neutral) Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
      a. Labeling of Fire Doors:
         1) Attach fire rating label to each fire rated unit.
         2) Fire rating label must be accessible, permanent (embossed on metal label), kept legible at all times, and shall contain the fire resistance rating in hours and/or minutes.
   3. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), 5-plies, and faces as indicated.

B. Fire Rated Doors if shown: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White oak, veneer grade in accordance with quality standard indicated, quarter cut, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. 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: Satin.

B. Factory finish doors in accordance with specified quality standard:
   1. Transparent Finish: Transparent catalyzed polyurethane, Premium quality, minimal sheen.
   2. Stain color shall be custom stain color as selected by Architect.

2.07 LIGHT FRAMES

A. Factory Glazing: Refer to Section 08 8000 - Glazing for glass view panels in flush wood doors. Factory install glass in fire rated doors only. Fill glazing bead nail holes in factory finished doors.

B. Wood Glass Stops (Beads) for Light Openings in Wood Doors: Provide manufacturer's standard flush wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces.
   2. Profile: Flush rectangular beads.
   3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips as required and approved for such use.
   4. Fill glazing bead (stops) nail holes after glass has been installed - fill to match door color.

C. Wood Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered non-combustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated. Profile per Marshfield Veneer Clad Light Bead, matching non-rated W-6 profile.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Install door louvers plumb and level.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Access door and frame units, fire-rated and non-fire-rated, in wall and ceiling locations.

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 04 2000: Openings in masonry.

C. Section 07 9005 - Joint Sealers.

D. Section 09 2116 - Gypsum Board Assemblies: Openings in gypsum ceilings or partitions.

E. Section 09 9100 - Painting: Field paint finish.

F. Divisions 22-26 Sections: Additional access doors provided and installed by Contractors for Plumbing, Mechanical, Electrical and related work.

1.03 SUMMARY

A. This Section includes access doors for installation in the following types of new construction:
   1. Gypsum drywall.
   2. Unit masonry.
   3. As otherwise indicated.

B. Provide fire-rated access doors where indicated or scheduled, and at access openings in all walls of stairs, elevator shafts and equipment rooms, other shafts and plumbing chase walls which are partially or fully open through floors, and at walls and ceilings indicated or required by Code to be fire-rated.

1.04 REFERENCE STANDARDS

A. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
   1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.

C. Shop Drawings: Indicate exact position of all access door units. Also indicate fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated access doors.
   1. Provide access doors of fire rating equivalent to the fire rated assembly in which they are to be installed.
   2. Provide products listed and labeled by UL as suitable for the purpose specified and indicated.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.'s “Building Materials Directory” for rating shown.
   1. Provide UL label on each fire-rated access door.
   2. Fire rating label must be accessible, permanent (embossed on metal label), kept legible at all times, and shall contain the fire resistance rating in hours and/or minutes.

1.07 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

C. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.08 PROJECT CONDITIONS

A. Coordinate the work with other work requiring access doors.

B. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

C. Special-Size Access Doors: Use where required or requested; indicate on schedule.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wall and Ceiling Access Doors:
1. Acudor Products Inc: www.acudor.com.
2. Bar-Co., Inc.
3. Cesco Products
4. J.L. Industries [Basis of Design]: www.activarcpg.com/jl-industries/.
5. Karp Associates, Inc: www.karpinc.com.
6. Larsens Manufacturing Co.
7. Milcor by Commercial Products Group of Hart & Cooley, Inc: www.milcorinc.com.
8. Nystrom: www.nystrom.com.
9. The Williams Brothers Corp.
10. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESS DOORS AND PANELS

A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

B. Units in Fire Rated Assemblies: Fire rating equivalent to the fire rated assembly in which they are to be installed.

2.03 MATERIALS AND FABRICATION: ACCESS DOOR UNITS - WALLS AND CEILINGS

A. Door and Frame Units: Formed steel.
1. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.
2. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
3. Frames and flanges: 0.058 inch steel.
    a. Fabricate frame with exposed flange, nominal 1-inch wide around perimeter of frame for units installed in the following construction:
        1) Exposed masonry.
        2) Exposed concrete.
        3) Exposed siding.
    b. For gypsum drywall or gypsum veneer plaster, furnish perforated flange frames with drywall bead.
    c. For full-bed plaster and E.I.F.S. applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
4. Door panels: 0.070-inch single thickness steel sheet.

a. Painted Flush Panel Doors (non-fire-rated and fire-rated): Fabricate from not less than 16-gage galvanized sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.
   1) Restore any damage to galvanized finish with cold-process galvanizing repair paint, prior to applying factory prime coating, or other finishes.
b. Stainless Steel Flush Panel Doors: Fabricate from not less than 18-gage stainless steel sheet, with concealed spring hinges or concealed piano hinge set to open 175 degrees. Buff exposed surfaces to #4 satin finish, except where other finishes are indicated.

5. Size: As indicated or as necessary to access and service equipment.
6. Hardware:
   a. Hardware for Fire-Rated Units: As required for listing.
   b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
   c. Hinge: 175 degree steel piano hinge with removable pin.
   d. Latch/Lock: Screw driver slot for quarter turn cam latch.
7. Galvanized, hot dipped finish, except where indicated otherwise.
8. Finish: No. 4 finish for stainless units.

B. Non-Fire Rated Door and Frame Units in Walls:
   1. Provide manufacturer's standard flush panel/door and frame.

C. Fire Rated Door and Frame Units in Walls:
   1. For fire rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

D. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

E. Finishes:
   1. Exterior: 3-coat 70% resin “Kynar 500” finish (i.e.: 7-mil prime coat, 9-mil color coat, and 9-mil clear top coat) with minimum 2.4 mil total dry film thickness, in color to match adjacent finish where occurs, unless otherwise selected by Architect from manufacturer's standard non-metallic colors - 15 colors minimum to select from, including white.
      a. Soffit Locations: Color to match soffit material color selection, unless otherwise selected by Architect.
   2. Interior, Exposed to Normal View: To match finish on interior. Door "Finish Hardware" (refer to Section 08 7100), or if not indicated, to match existing hardware in room where occurs.
   3. Interior, in Service Areas, Above Ceilings, etc: Factory primed baked enamel.
   4. Toilet Rooms, Janitors Rooms, Kitchens, Kitchen Areas, Rooms Where Food is Stored, Prepared, Cooked and/or Served, and Break Rooms: Stainless steel, No. 4, satin finish.

2.04 FABRICATION

A. Weld, fill, and grind joints to ensure flush and square unit.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings in relation to adjacent finish surfaces. Secure rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

D. Coordinate installation with work of other trades.

E. Prepare perimeter of rough openings in concrete, CMU, and clay masonry with mortar/grout full-depth of wall and to size required; use pressure-treated wood as necessary for other concealed blocking, grounds, and supports at any stud wall construction.

3.03 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 3313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

B. Fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough openings.

B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 09 2116 - Gypsum Board Assemblies: Rough openings.

D. Section 09 9123 - 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.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. Alpine Overhead Doors, Inc: www.alpinedoors.com/#sle.
   2. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   3. Raynor Garage Doors: www.raynor.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Doors, Non-Fire-Rated: Powder Coated slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Nominal Slat Size: 1-1/4 inches wide.
   3. Slat Profile: Flat, perforated.
   4. Finish, Aluminum: Anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. Finish Color: As selected by Architect from manufacturer's full range of colors (minimum 150 RAL colors).
   6. Guides: Formed track; same material and finish unless otherwise indicated.

7. Hood Enclosure: Manufacturer's standard; primed steel.
8. Manual hand chain lift operation.
9. Locking Devices: Slide bolt on inside.

2.03 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Guides for Galvanized Curtains: ASTM A36/A36M steel angles, size as indicated, hot-dip galvanized per ASTM A123/A123M.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
   1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.
   2. Manual Chain Lift: Provide padlockable chain keeper on guide.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

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.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft 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.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Interior storefront.

C. Aluminum doors and frames.

D. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 05 5000 - Metal Fabrications: Steel attachment devices.

C. Section 07 8400 - Firestopping: Firestop at system junction with structure.

D. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 08 4413 - Glazed Aluminum Curtain Walls.

F. Section 08 7100 - Door Hardware: All door hardware, except weatherstripping.

G. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Samples: Submit two samples 12 by 12 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

G. Submit all storefront materials and accessory products to glazing manufacturer to verify materials compatibility with glazing.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 MOCK-UP

A. Include Aluminum-Framed Storefront in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Warranty shall include language relating to watertightness and air tightness.

E. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

F. Glazing Warranty: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
1. Kawneer North America [Basis of Design]: www.kawneer.com.
2. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
3. YKK AP America, Inc. : www.ykkap.com.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Include structural reinforcing in mullions as required.

2. Include solid back frame closure at end of storefront runs, sides and top of storefront.
3. Glazing Rabbet: For 1 inch insulating glazing for exterior applications. As indicated for interior applications.
4. Glazing Position: ____
   a. Interior: Inside glazed, center plane, unless indicated otherwise.
5. Provide miscellaneous framing as indicated on drawings.
6. Water Leakage Test Pressure Differential: 12 lbf/sq ft.
7. Air Infiltration Test Pressure Differential: 6.24 psf.
8. Finish: Class I natural anodized.
   a. Factory finish all surfaces that will be exposed in completed assemblies.
   b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
9. Finish Color: As selected from manufacturer's full range.
10. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
11. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
12. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
13. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
14. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
15. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Cross-Section: As indicated on drawings.

B. Glazing: As specified in Section 08 8000.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 7 inches wide, nominal.
   3. Middle Rail: 8 inches wide, nominal.
   4. Vertical Stiles: 7 inches wide, minimum.
   5. Bottom Rail: 10 inches wide, minimum.
   6. Glazing: Double glazed.
   7. Finish: Match Architects sample

D. Provide filler panel to close back of frame.

E. Sub-Sill: At all sill locations (whether or not indicated on the Drawings) provide matching extruded aluminum sub-sill with end dams.

2.04 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   1. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at specified differential pressure across assembly in accordance with ASTM E 283.

D. Water Leakage: None, when measured in accordance with ASTM E 331 at specified pressure differential.

E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

F. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

E. Glazing Accessories: As specified in Section 08 8000.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick. Extent: All storefront.

B. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

C. Color:
1. Exterior: To be selected by Architect from manufacturer's full range.
2. Interior: To be selected by Architect from manufacturer's full range.

2.07 HARDWARE

A. For each door, include weatherstripping.

B. Other Door Hardware: As specified in Section 08 7100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.08 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardwareand door operators.

G. Increase gauge or reinforce framing members as required for imposed loads and span conditions.

H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.

1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

I. Fit and seal primary frame joints prior to installing filler panel.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions, and with AAMA - Metal Curtain Wall, Window, Storefront and Entrance - Guide Specifications Manual.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

K. Install perimeter sealant in accordance with Section 07 9010.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

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SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass and metal infill panels.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 05 1200 - Structural Steel Framing: Steel attachment members.

C. Section 05 4000 - Cold-Formed Metal Framing: Metal studs framing at exterior of building.

D. Section 05 5000 - Metal Fabrications: Steel attachment devices.

E. Section 07 8400 - Firestopping: Firestop at system junction with structure.

F. Section 07 9010 Joint Sealers: Sealing joints between frames and adjacent construction.

G. Section 08 4313 - Aluminum-Framed Storefronts: Entrance framing and doors.

H. Section 08 8000 - Glazing: Glass, and Spandrel Panels.

I. Section 09 2116 - Gypsum Board Assemblies: Metal stud and gypsum board wall at interior of curtain wall.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 8 by 8 inches in size illustrating finished aluminum surface, glazing, infill panels, and glazing materials.

E. Submit all curtain wall materials and accessory products to glazing manufacturer to verify materials compatibility with glazing.

F. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

G. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

H. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the state in which the project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.

1.07 MOCK-UP

A. Include Glazed Aluminum Curtain Walls in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty shall include language relating to watertightness and airtightness.

D. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

E. Provide five (5) year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Kawneer North America; Model 1600UT System 1 Curtain Wall; [Basis of Design]: www.kawneer.com.
   2. Oldcastle Building Envelope: www.oldcastlebe.com.
   3. YKK AP America, Inc.: www.ykkap.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Cross-Section:
      a. 2-1/2 x 7-1/2 inch nominal dimension.
      b. Provide 2-1/2" covers at perimeter conditons [head, jamb, sill] where curtin wall abutts adjacent wall material and at other location indicated.
      c. Provide standard 1" [nominal] cover at all other locations.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
   4. Both vertical and horizontal span, where indicated.
   5. Manufacturer shall provide mullion to satisfy single span dimension of 24'-0" on a horizontal spacing of 3'-4" that can accommodate a lateral load of 28 psf.

B. Glazing: As specified in Section 08 8000.

C. Curtainwall Anchors
   1. Finish: anchors exposed to view to match curtainwall finish.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

E. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

F. Exposed Flashings: 0.032 inch thick aluminum sheet; finish to match framing members.

G. Concealed Flashings: 0.018 inch thick galvanized steel.

H. Firestopping: As specified in Section 07 8400.

I. Glazing: As specified in Section 08 8000.

J. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

K. Glazing Accessories: As specified in Section 08 8000.

L. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.04 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Color: To be selected by Architect from manufacturer's standard range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.05 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce framing members for imposed loads.

G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Install perimeter sealant in accordance with Section 07 9010.

I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. The following testing will be performed by the Owner's testing agency. The General Contractor and appropriate subcontractors shall be available to coordinate and support testing process.

C. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

D. Provide field testing of installed curtain wall system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

E. Test installed curtain wall for water leakage in accordance with ASTM E1105 with a uniform test pressure difference of 8.00 lbf/sq ft . Testing shall include elements of curtain wall, and air and watertight transitions between curtain wall and water/air barrier coating behind adjacent veneer/claddings.
   1. Perform this testing after installation of water/air barrier coating on sheathing behind veneer/claddings, but before veneer/claddings are installed.

F. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

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SECTION 08 5619
PASS THRU WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service and Teller Windows:
   1. Manual pass, service, and teller window units.
   2. Glazing.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry.

B. Section 05 40 00 - Cold-Formed Metal Framing.

C. Section 06 10 00 - Rough Carpentry.

D. Section 07 62 00 - Sheet Metal Flashing and Trim.

E. Section 07 90 00 - Joint Protection.

F. Section 08 41 13 - Aluminum-Framed Entrances and Storefronts.

1.03 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

B. American Society Mechanical Engineers (ASME):
   1. ASME SA-240/SA-240M - Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM International (ASTM):
   1. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application.
   2. ASTM A36/A36M. - Standard Specification for Carbon Structural Steel.
   3. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
   4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   7. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   8. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   9. ASTM B221/B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   10. ASTM C1036 - Standard Specification for Flat Glass.
   11. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
   12. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   13. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
   14. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
   15. ASTM E699 - Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.
   16. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
   17. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
   18. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

19. ASTM F588 - Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.
20. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

D. Consumer Products Safety Commission (CPSC):
1. 16 CFR 1201 - Safety Standard for Architectural Glazing.

E. CSA International - Canadian Standards Association (CAN/CSA):
1. C22.2 No. 68 - Motor-Operated Appliances (Household and Commercial).
2. C22.2 No. 247 - Operators and Systems of Doors, Gates, Draperies and Louvers.

F. DuPont Powder Coating (DPC):
1. TM 10.219 - PCI Powder Smoothness.

G. National Association of Architectural Metal Manufacturers (NAAMM):
1. No. 3 Finish: Ground unidirectional uniform finish obtained with 80 - 100 grit abrasive.

H. Steel Structures Painting Council (SSPC):
1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

I. Underwriters Laboratory (UL):
1. UL 73 - Standard for Motor-Operated Appliances.
2. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
3. UL 752 - Standard for Bullet Resisting Equipment.
4. UL 1995 - Heating and Cooling Equipment.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
1. Manufacturer's data sheets on each product to be used.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Typical installation methods with requirements to accommodate specific site conditions.

C. Verification Samples: Two samples, 4 x 4 inches (100 x 100 mm) in size illustrating metal finishes for each finish specified.

D. Shop Drawings: Verify field measurements prior to fabrication, record on Shop Drawings.
1. Details of materials, construction and finish including relationship with adjacent construction.
2. Configuration, sizes, rough-in, mounting, construction and glazing details as well as installation clearances and finishes.

E. Test Reports: Indicate compliance with specified bullet resistance performance.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience.
1. Participates in a Quality Assurance validation Program.
2. Facility Audit.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience with projects of similar scope and complexity.

C. Source Limitations: Each product type sourced from single manufacturer for uniformity.

D. Products Requiring Electrical Connection: Listed and classified by UL or testing firm acceptable to authorities having jurisdiction.

E. Testing Agency Qualifications: Qualified according to ASTM E699
1. Experienced in forced-entry-resistance testing.
2. Experienced in ballistics-resistance testing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store window units and accessories in manufacturer's standard shipping containers and protective packaging. Deliver and store window units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store window units and accessories on raised blocks to prevent moisture damage vandalism. Protect from damage due to weather, excessive temperature, construction operations and vandalism.

C. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturer's standard warranty document, executed by a manufacturer authorized officer in which manufacturer agrees to repair or replace windows, drawers and air curtains that fail in materials or workmanship.
   1. Warranty Period: One year parts and labor from date of installation.

B. Failures: Including but not limited to the following.
   1. Deterioration of metal, metal finishes, other materials beyond normal weathering, use.
   2. Failure of welds and structural failures including deflections over 1/4 inch (6 mm).
   3. Faulty operation of sliding window hardware, transaction drawers and air curtains.
   4. Excessive air leakage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Service and Teller Window Units:
   1. Easi-Serv Products: www.easi-serv.com/#sle.
   2. Quikserv: www.quikserv.com/#sle.
   3. Ready Access, Inc: www.ready-access.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - GENERAL

A. Service and Teller Windows - Performance and Design Requirements:
   1. Service and Teller Windows: Complete from factory with flashing, anchors, clips, and accessories required for complete installation.
      a. System Design: Components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.
         1) Reglazable from secure side without dismantling the nonsecure side of framing.
      b. Fabrication: General.
         1) Fabricate window to dimensions indicated on Drawings.
         2) Windows, drawers, and accessories to provide a complete system for assembly of components and anchorage of window, drawers, and accessories.
         3) Prepare components with reinforcement required for hardware.
         4) Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Corners fully welded.
         5) Factory glaze window units, as required for applications indicated.
         6) Prepare security windows for glazing unless pre-glazing at factory is indicated.
         7) Fabricate units that have tempered glass with roller-wave distortion parallel to bottom edge of glass as installed.
         8) Weep holes and internal water passages for exterior security windows to conduct infiltrating water to the exterior.

c. Welding: To greatest extent possible, welded prior to finishing and in concealed locations to minimize distortion or discoloration of finish.
   1) Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding prior to finishing.
d. System Internal Drainage: Weep drainage network drains water entering joints, condensation occurring in glazing channels, and migrating moisture occurring within system to the exterior.
e. Factory-Cut Openings in Glazing: For speaking apertures, as indicated on Drawings.
f. Bottom Sills: Stainless steel construction; bottom tracks or pop rivets not acceptable.
g. Track and Slides for Windows and Drawers: Stainless steel ball bearing slides.
h. Handles: Stainless steel, manufacturer's standard profile and finish.
i. Embedded Plate Anchors: Fabricated from steel shapes and plates; headed studs welded to back of plate.
j. Metal Protection: Dissimilar metals separated to prevent galvanic action by painting contact surfaces with primer or applying manufacturer approved sealant or tape.
k. Weather Stripping: Factory applied.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221/B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish.
   1. Ultimate Tensile Strength: Not less than 22,000 psi (151 MPa).
   2. Thickness of Main Frame and Sash Members: Not less than 0.125 inch (3.2 mm).

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Metallic-Coated Steel Sheet:
   1. ASTM A653/A653M: CS Commercial Steel, Type B; with G90 (Z275) zinc (galvanized) coating designation.
   2. AMS5511: Steel, corrosion-resistant, sheet, strip, and plate, 19 Cr, 9.5 Ni (304L), solution heat treated.
   3. AMS5513: Steel, corrosion-resistant, sheet, strip, and plate, 19 Cr, 9.2 Ni (SAE 30304) solution heat treated.

D. Stainless Steel: Sheet, strip, plate, and flat bars.
   1. ASTM A666: Austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
   2. ASME SA-240/SA-240M: Chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications.

E. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

F. Cast-in-Place Anchors in Concrete: Corrosion-resistant materials capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing per ASTM E488, conducted by a qualified testing agency.
   1. Threaded or Wedge Type: Galvanized ferrous castings.
      a. Cast Steel: ASTM A27/A27M.
      b. Malleable Iron: ASTM A47/A47M.
   2. Bolts, Washers, and Shims: ASTM A153/A153M or ASTM F2329 Hot dip galvanized.

G. Embedded Plate Anchors: Fabricated from steel shapes and plates; headed studs welded to back of plate. Thickness: 3/16 inch (4.8 mm). Diameter: 1/2 inch (12.7 mm).

H. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.76 mm) coat thickness.

I. Sealants and Gaskets: Manufacturer's standard for joint size and movement; designed to remain permanently elastic, nonshrinking, and nonmigrating.

2.04 GLASS GLAZING MATERLALS - GENERAL

A. Air Barrier and Vapor Retarder: Installed continuous to building. Utilizes the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.

B. Structural Design: Glass and glazing designed according to applicable code for most critical combination of wind, snow, seismic, and dead loads.

C. Miscellaneous Glazing Materials: Material, sizes, and shapes complying with requirements of glass manufacturers, with a proven record of compatibility with surfaces contacted in installation.
   1. Cleaners, Primers, and Sealers: Approved by sealant or gasket manufacturer.
   2. Setting Blocks: Elastomeric material. Type A Shore durometer hardness of 80 to 90.
   3. Spacers: Elastomeric blocks or continuous extrusions. Type A Shore durometer hardness as required by glass manufacturer to maintain glass lites in place.
   4. Edge Blocks: Elastomeric material of hardness required to limit glass lateral movement or side walking.

D. Float Glass Materials:
   1. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.
   2. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
      a. Fabricate units having tempered glass with roller-wave distortion parallel to bottom edge of glass as installed.
      b. Tempered glass conforming to CPSC 16 CFR 1201 Category II.

E. Clear Glass: Annealed and tempered float glass as specified; Class 1 clear.
   1. Minimum Thickness: 1/4 inch (6 mm).

F. Tinted Glass: Tempered float glass as specified; Class 2 tinted.
   1. Minimum Thickness: 1/4 inch (6 mm).
   2. Tint: Color as selected by Architect.

2.05 SHOP FINISHING

A. Extent of Finishing: General.
   1. Factory coating applied to surfaces exposed in completed assemblies.
   2. Finish applied to surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   3. Touch-up materials recommended by coating manufacturer are field applied to cut ends and minor damage to factory applied finish.

B. Aluminum:
   1. Mill Finished Surfaces: Manufacturer's standard finish.
   2. Painted Finishes:
      a. DuPont Powder Coating Test Method: DPC TM 10.219, PCI Powder Smoothness.
      b. AA-M12C12R1x: Non-specular as fabricated mechanical finish, chemically cleaned, and prepared for applied coating with organic coating.
         1) Organic Coatings: Manufacturer's standard powder coat finish.
         2) Organic Coatings: Powder coat conforming to AAMA 2603.
   3. Clear Anodized Surfaces: Conforms to AAMA 611.
      a. AA-M10C22A31: Non-specular as fabricated mechanical finish, medium matte chemical finish.
      b. Architectural Class II 0.7 mils (0.018 mm) clear anodized coating.
   4. Color Anodized Surfaces: Conforms to AAMA 611
      a. AA-M10C22A34: Non-specular as fabricated mechanical finish, medium matte chemical finish.
      b. Architectural Class II 0.7 mils (0.018 mm) coating.

C. Concealed Steel Items: Compliance: Galvanized in accordance with ASTM A123.
   1. Thickness: Grade 85, 2.0 oz per sq ft (610 g per sq m).

D. Stainless Steel: Type 304 stainless steel with NAAMM No. 3 finish.

E. Bituminous Paint: Applied to concealed metal surfaces in contact with cementitious or dissimilar materials.

F. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.

2.06 WINDOWS - MANUAL TRANSACTION

A. Manual Exterior and Interior Pass, Service and Teller Windows: Manual Bi-folding window and Tri-folding window. Operated manually.
   1. Service Opening (WxH): As indicated in the drawing.
   2. Rough Opening (WxH): As indicated in the drawing.
   3. Glazing: Tempered, 1/4 inch (6 mm) thick safety glass.
   4. Finish: As selected by the Architect.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions.
   1. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
   2. Verify field measurements prior to fabrication and recorded on Shop Drawings.
   3. Verify construction is ready to receive Products specified in this section.
   4. Verify rough openings are correct size and in correct location.
   5. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
   6. Examine frames and anchors to other sections as required for installation in surrounding partition and casework construction.
   7. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   8. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
   9. For glazing whose orientation is critical for performance, verify installation orientation.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
   1. Connect electrical components to power source.
   2. Glaze windows in accordance with manufacturer's instructions.
   3. Align Products plumb, level, and square.
   4. Rigidly secure products to adjacent supporting construction.
   5. Seal perimeter joints.

B. Protection for Dissimilar Materials:
   1. Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.03 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.04 TESTING AND ADJUSTING

A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

B. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and secure enclosure.

C. Adjust transaction drawers to provide a tight fit at contact points for weathertight enclosure.

3.05 CLEANING AND PROTECTION

A. Clean and protect products in accordance with the manufacturer's recommendations.
   1. Remove protective material from factory finished surfaces.
   2. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
   3. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.
   4. Clean metal and glass surfaces to polished condition.
   5. Lubricate sliding security window hardware and transaction drawer hardware.

B. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

C. Touch-up, repair or replace damaged products including security windows that are warped, bowed, or otherwise unacceptable before Substantial Completion.

3.06 DEMONSTRATION AND TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems installed.

END OF SECTION

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SECTION 08 71 00
DOOR HARDWARE

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 items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:

1. Architectural Hinges
2. Continuous Hinges
3. Pivots Sets
4. Key Control System, Cylinders and Cores.
5. Locksets, Latchsets and Deadbolts
6. Panic Devices and Fire Rated Exit Devices
7. Closers and Door Control Devices
8. Automatic Door Operators
9. Overhead Door Stops and Holders
10. Floor and Wall Stops
11. Door Bolts and Coordinators
12. Door Pulls, Push/Pull Plates and Push/Pull Sets
13. Protective Plates
14. Door Seals, Gasketing and Weatherstripping
15. Thresholds
16. Miscellaneous Door Control Devices
17. Electromechanical Hardware
18. Miscellaneous Access Control Components and Security Equipment

C. Related Sections: The following Sections contain requirements that relate to the following sections.

1. Section 08 1113: Hollow Metal Doors and Frames
2. Section 08 1400: Wood Doors
3. Section 08 3323: Coiling Doors
4. Section 08 4113: Aluminum-Framed Entrances and Storefronts
5. Division 26: Electrical
6. Division 28: Electronic Safety and Security

D. Products furnished but not installed under this Section to include:

1. Cylinders for locks on entrance doors.
2. Final replacement cores and keys to be installed by Owner.

1.3 REFERENCES:

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements. For items other than those scheduled in the “Headings” of Section 3, provide catalog information for the specified items and for those submitted.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format “hardware sets" indicating complete designations of every item required for each door or opening. Use specification heading numbers with any variations suffixed a, b, etc. Include the following information:

a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
e. Explanation of all abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.
h. Keying information.
i. Cross-reference numbers used within schedule deviating from those specified.
j. Column 1: State specified item and manufacturer.
k. Column 2: State prior approved substituted item and its manufacturer.

2. Furnish complete wiring diagrams, riser diagrams, elevation drawings and operational descriptions of electrical components and systems, listed by opening in the hardware submittals. Elevation drawings shall identify locations of the system components with respect to their placement in the door opening. Operational descriptions shall fully detail how each electrical component will function within the opening, including all conditions of ingress and egress. Provide a copy with

each hardware schedule submitted for approval. Supply a copy with delivery of hardware to the jobsite and another copy to the Owner at the time of project completion.

3. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Provide samples if requested of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

F. Contract closeout submittals:

1. Operation and maintenance data: Complete information for installed door hardware.
2. Warranty: Completed and executed warranty forms.

1.5 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.

1. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who is available for consultation to Owner, Architect, and Contractor, at reasonable times during the Work.

B. Coordination Meetings:

1. Contractor to set up and attend the following:

a. Lock distributor to meet with the Owner to finalize lock functions and keying requirements and to obtain final instructions in writing.
b. Lock distributor and lock, closer and exit device manufacturer to meet with the installer prior to beginning of installation of door hardware. Instruct installer on proper installation of specified products.

2. General Contractor to set up and attend the following:
3. Meet with the Owner, General Contractor, Supplier, electrical and security contractors to coordinate all electrical hardware items. Supplier to provide riser diagrams, elevation drawings, wiring diagrams and operational descriptions as required by the General and sub-contractors.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 requirements of authorities having jurisdiction.

1. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not. All hardware to comply with State and local codes and UL 10C.

2. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

D. All hardware is to comply with Federal and State Handicap laws.

E. Substitutions: Request for substitutions of items of hardware other than those listed as "acceptable and approved" shall be made to the architect in writing no later than fourteen (14) days prior to bid opening. Approval of substitutions will only be given in writing or by Addenda. Requests for substitutions shall be accompanied by samples and/or detailed information for each manufacturer of each product showing design, functions, material thickness and any other pertinent information needed to compare your product with that specified. Lack of this information will result in a refusal.

F. Pre-Installation Coordination:

1. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years' experience in successful completion of projects similar in size and scope.
2. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
3. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware items, and any other effected subcontractors or suppliers.
4. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

1.6 PRODUCT HANDLING:

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.7 WARRANTY:

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use, or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

B. Warranties:

1. Locksets: 10 Year Period
2. Electromechanical Locksets: 3 Year Period

3. Exit Devices: 10 Year Period
4. Surface Closers: 30 Year Period
5. Power Supplies: 3 Year Period
6. Weather Stripping/Gasketing: 5 Year Period
7. Overhead Stops: 10 Year Period

1.8 MAINTENANCE:

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions that are packed in hardware items for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Parts kits: Furnish manufacturers' standard parts kits for locksets, exit devices, and door closers.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the hardware schedule at the end of this Section.

2.2 MANUFACTURED UNITS: (*Denotes manufacturer referenced in the Hardware Headings)

A. Hinges:

1. Acceptable manufacturers:

a. Ives*
b. Stanley
c. McKinney

2. Characteristics:

a. Provide hinges conforming to ANSI/BHMA A156.1.
b. Provide five knuckle, ball bearing hinges.
c. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

1) Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
2) Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

d. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

1) Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
2) Interior: Heavy weight, steel, 5 inches (127 mm) high

e. 2 inches or thicker doors:

1) Exterior: Heavy weight, bronze, or stainless steel, 5 inches (127 mm) high
2) Interior: Heavy weight, steel, 5 inches (127 mm) high

f. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
g. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
h. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
i. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1) Steel Hinges: Steel pins
2) Non-Ferrous Hinges: Stainless steel pins
3) Out-Swinging Exterior Doors: Non-removable pins
4) Out-Swinging Interior Lockable Doors: Non-removable pins
5) Interior Non-lockable Doors: Non-rising pins

j. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

B. Geared Continuous Hinges:

1. Acceptable manufacturers:

a. Ives*
b. Select Products
c. Markar

2. Characteristics:

a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
g. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

C. Power Transfer:

1. Acceptable manufacturers:

a. Von Duprin EPT-10

2. Requirements:

a. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
b. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.
c. All hardwired, door mounted, electrified hardware to receive EPT-10 power transfer, unless scheduled authorized

D. Cylinders and Keying:

1. Acceptable manufacturers:

a. Schlage 29T

2. Characteristics:

a. New Keying System: Except as otherwise indicated, provide new master key system for project.
b. Equip locksets with Full Size Interchangeable Cores (FSIC) featuring patented, restricted keys (Schlage Everest 29T) and auxiliary locking pin. Patented key and cylinder design to be valid until 2029.
c. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

d. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
e. Permanently inscribe each key with number of locks that identifies cylinder manufacturer's key symbol, and notation, “DO NOT DUPLICATE”.
f. Key Material: Provide keys of nickel silver only.
g. Furnish the following Key Quantities:

1) Three (3) change keys for each lock.
2) Five (5) master keys for each master system.
3) Five (5) grandmaster keys for each grandmaster system.
4) Ten (10) construction master keys.
5) Two (2) construction Control Keys.
6) One (1) extra blank for each lock.

h. Furnish construction master keys to General Contractor.

1) Deliver keys to Owner.

i. Key Control Software: Schlage Sitemaster 200 for Windows or equivalent, supplied with factory bitting, and keyset symbols.

E. Mortise Locksets and Latchsets: as scheduled.

1. Acceptable manufacturers:

a. Schlage L9000 Series*
b. Sargent 8200 Series
c. Corbin Russwin ML2000 Series

2. Required Features:

a. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
b. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
c. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
d. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
e. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
f. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
g. Provide motor based electrified locksets that comply with the following requirements:

1) Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
2) Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
3) Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
4) Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
5) Connections – provide quick-connect Molex system standard.

h. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

1) Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.

i. Scheduled Lock Series Design:

a) Lever Design 17
b) Rosette Design A.

F. Deadlocks:

1. Acceptable manufacturers:

a. Schlage L400 series

2. Requirements:

a. Provide mortise deadlock series conforming to ANSI/BHMA A156.
b. Cylinders: Refer to “KEYING” article, herein.
c. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
d. Provide manufacturer’s standard strike.

G. Exit Devices:

1. Acceptable manufacturers:

a. Von Duprin 98 Series*
b. Sargent 8000 Series
c. Precision Apex 2100

2. Characteristics:

a. Exit devices to be UL Listed for life safety. Exit devices for fire rated openings to have “UL" labels for “Fire Exit Hardware."
b. Exit devices mounted on labeled wood doors to be mounted on the door per the door manufacturer’s requirements.
c. All trim to be thru bolted to the lock stile case.
d. Lever trim to be solid case material with a break-away feature to limit damage to the unit from vandalism. Lever design to match locksets.
e. All exit devices to be made of brass, bronze, stainless steel, or aluminum material, powder coated, anodized, or plated to the standard architectural finishes to match the balance of the door hardware.
f. Provide glass bead kits (GBK) to shim exit devices on doors with raised glass beads, as required.
g. All exit devices to be one manufacturer. No deviation will be considered.
h. All series exit devices to incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. All exit devices to be non-handed. Touchpad to extend a minimum of 1/2 of the door width and to extend to the height of the cross-rail housing for a “no pinch” operation. Plastic touchpads are not acceptable. All latchbolts to be the deadlocking type. Latchbolts to have a self-lubricating coating to reduce wear. Plated or plastic coated latchbolts are not acceptable. Plastic linkage and “dogging” components are not acceptable.
i. Surface vertical rod devices to be UL labeled for fire door applications without the use of bottom rod assemblies. Where bottom rods are required for security applications, the devices to be UL labeled for fire doors applications with rod and latch guards by the device manufacturer.
j. Exit devices to include impact resistant, flush mounted end cap design to avoid damage due to carts and other heavy objects passing through an opening. End cap to be of heavy-duty

metal alloy construction and provide horizontal adjustment to provide alignment with device cover plate. When exit device end cap is installed, no raised edges will protrude.

H. Surface Closers:

1. Acceptable manufacturers:

   a. LCN Closers 4040XP/4020 Series*
   b. Norton 9500 Series
   c. Corbin Russwin DC8000

2. Characteristics:

   a. Door closers to have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.
   b. All closers to utilize a stable fluid withstanding temperature range of 120oF to -30oF without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors to be provided with temperature stabilizing fluid that complies with standards UBC 7-2 (1997) and UL 10C.
   c. Spring power to be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped. Spring power adjustment (LCN Fast ™ Power Adjust) allows for quick and accurate power adjustment and visually shows closer power size settings by way of dial adjustment gauge located on closer spring tube. Hydraulic regulation to be by tamper-proof, non-critical valves. Closers to have separate adjustment for latch speed, general speed, and back check.
   d. All closers to have solid forged steel main arms (and forearms for parallel arm closers) and where specified to have a cast-in solid stop on the closer shoe (“CUSH”). All parallel arm mounted closers to have “EDA” type arms or, where door travel on out-swing doors must be limited, use “CUSH” or “SCUSH” type closers. Auxiliary stops are not required when “CUSH” type closers are used. Provide drop plates where top rail of door is not sufficient for closer mounting. Provide “cush shoe supports” and “blade stop spacers” where dictated by frame details.
   e. Overhead concealed closers to have spring power adjustable for 50% increase in closing power and fully mortised door tracks.
   f. All surface closers to be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. All closers (overhead, surface and concealed) to be of one manufacturer and carry manufacturer's ten-year warranty (electric closers to have two-year warranty).
   g. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped provide adjustable units complying with ADA and ANSI A-117.1 provisions for door opening force.
   h. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors to provide for corridor clear width as required by code. Where possible, mount closers inside rooms.
   i. Powder coating finish to be certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
   j. Combination Door Closers and Holders: Provide units designed to hold door in open position under normal usage and to release and automatically close door under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts.
   k. Magnetic Door Holders to be heavy duty wall or floor mounted with metal housing and complete mounting hardware. Provide 24V holding coils unless otherwise scheduled.
   l. Where specified, security closers (Series 4040XP and 146) to have heavy duty forged steel arms with special joints to prevent disassembly. All covers to be one-piece drawn metal and utilize a four-point mounting. All exposed fasteners to have hex-lobular drive with a security pin.

I. Overhead Door Stop/Holders:

1. Acceptable manufacturers:

    a. Glynn Johnson*
    b. Rixson Firemark

2. Characteristics:

    a. Provide heavy duty concealed door holders of stainless steel.
    b. Provide heavy duty surface mounted door holders of stainless steel.
    c. Provide medium duty concealed door holders of stainless steel.
    d. Provide medium duty surface mounted door holders of stainless steel.
    e. Provide light duty concealed door holders of stainless steel.
    f. Provide light duty surface mounted door holders of stainless steel.
    g. Concealed holders to be installed with the jamb bracket mortised flush with the bottom of the jamb. The arm and channel to be mortised into the door.
    h. Surface holders to be installed with the jamb bracket mounted on the stop.
    i.

J. Floor Stops and Wall Bumpers:

1. Acceptable manufacturers:

    a. Ives*
    b. Trimco
    c. Rockwood Manufacturing

2. Characteristics: Refer to Hardware Headings.

K. Door Bolts/Coordinators:

1. Acceptable manufacturers:

    a. Ives*
    b. Trimco
    c. Rockwood Manufacturing

2. Characteristics:

    a. Flush bolts to be forged brass 6-3/4" x 1", with 1/2" diameter bolts. Plunger to be supplied with milled surface one side that fits into a matching guide.
    b. Automatic flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
    c. Self-latching flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
    d. Automatic flush bolts and self-latching flush bolts to be UL listed for fire door application without bottom bolts (LBB).
    e. Furnish dust proof bottom strikes.
    f. Coordinator to be soffit mounted non-handed fully automatic UL listed coordinating device for sequential closing of paired doors with or without astragals.
    g. Provide filler piece to close the header. Provide brackets as required for mounting of soffit applied hardware.

L. Push Plates:

1. Acceptable manufacturers:

    a. Ives*
    b. Trimco
    c. Rockwood Manufacturing

2. Characteristics:

    a. Exposed Fasteners: Provide manufacturers standard exposed fasteners.
    b. Material to be forged stainless steel, per the Hardware Headings.

c. Provide plates sized as shown in Hardware Headings.

M. Door Pulls & Pull Plates:

1. Acceptable manufacturers:

a. Ives*
b. Trimco
c. Rockwood Manufacturing

2. Characteristics:

a. Provide concealed thru-bolted trim on back-to-back mounted pulls, but not for single units.
b. Material to be forged stainless steel.
c. Provide units sized as shown in Hardware Headings.

N. Push Pull Sets:

1. Acceptable manufacturers:

a. Ives*
b. Trimco
c. Rockwood Manufacturing

2. Characteristics:

a. Provide mounting systems as shown in hardware sets.
b. Material to be tubular stainless steel.
c. Provide Push/Pull sets sized as shown in Hardware Headings.

O. Protective Plates:

1. Acceptable manufacturers:

a. Ives*
b. Trimco
c. Rockwood Manufacturing

2. Characteristics:

a. Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
b. Materials:
c. Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
d. Fabricate protection plates not more than 2 inches less than door width on push side and not more than 1 inch less than door width on pull side.
e. Kick plates and Mop plates to be 1” less that bottom rail height where applicable.
f. Sizes:

1) Kick plates to be 8 inches in height.
2) Mop plates to be 6 inches in height.

P. Thresholds:

1. Acceptable manufacturers:

a. Zero Weatherstripping Co., Inc.*
b. Pemko
c. Reese Industries

2. Types: Indicated in Hardware Headings.

Q. Door Seals/Gasketing:

1. Acceptable manufacturers:
    a. Zero Weatherstripping Co., Inc.*
    b. Pemko
    c. Reese Industries
2. Types: Indicated in Hardware Headings.

R. Silencers:
1. Acceptable manufacturers:
    a. Ives*
    b. Hager
    c. Rockwood Manufacturing
2. Provide three for each single door; two for each pair of doors.

S. Key Cabinet and System:
1. Acceptable manufacturers:
    a. Telkee, Inc. (AS REQUIRED)
2. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the project.
3. Provide complete cross index system set up by key control distributor, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
4. Provide hinged-panel type cabinet for wall mounting.
5. Provide multiple-drawer type cabinet.

T. Knox Box:
1. Acceptable manufacturers:
    a. Knox Box 3200 Series. (AS REQUIRED)
2. Characteristics:
    a. Provide one surface mount Knox Box 3200 Series.
    b. Provide unit compatible with the local Fire Department Knox key system.
    c. General contractor shall install in location provided by architect.

2.3 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire rated labels and as otherwise acceptable to Architect.
1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.

1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
2. Furnish screws for installation with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
4. Use thru-bolts for installation of all exit devices, closers, and surface-mounted overhead stops. Coordinate with wood doors and metal doors and frames. Where thru-bolts are used, provide sleeves for each thru-bolt as a means of reinforcing the work, or provide sex nuts and bolts.

2.4 Hardware Finishes:

A. Match items to the manufacturer’s standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide finishes that match those established by ANSI or, if none established, match the Architect’s sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

F. All hardware to be 626 (US26D), 652 (US26D) Satin Chrome Finish, with the following exceptions:

1. Exterior Butt Hinges: 630 (US32D) Satin Stainless Steel
2. Interior Butt Hinges: 652 (US26D) Satin Chrome Plated Steel Base Material
3. Continuous Hinges: 628 (US28) Clear Anodized Aluminum
4. Door Closers: 689 Powder Coat Aluminum
5. Push Plates: 630 (US32D) Satin Stainless Steel
6. Pull Plates: 630 (US32D) Satin Stainless Steel
7. Protective Plates: 630 (US32D) Satin Stainless Steel
8. Overhead Holders: 630 Satin Stainless Steel

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface

protection with finishing work specified in the Division 9 Sections. Do not install surface mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section “Joint Sealers”.

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING:

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Door Hardware Supplier's Field Service:

1. Inspect door hardware items for correct installation and adjustment after complete installation of door hardware.
2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
3. File written report of this inspection to Architect.

D. HARDWARE SCHEDULE

HARDWARE SET: 01

DOOR NUMBER:
203

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	PANIC HARDWARE	CD-98-NL	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	MORTISE CYLINDER	20-061 ICX	SCH
2	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER
1	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 02

DOOR NUMBER:
125B

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	PANIC HARDWARE	LD-98-NL	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 03

DOOR NUMBER:
127D 127E 127F

EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	REMOVABLE MULLION	KR4954 STAB	VON
1	PANIC HARDWARE	CD-98-NL	VON
1	RIM CYLINDER	20-057 ICX	SCH
3	MORTISE CYLINDER	20-061 ICX	SCH
4	FSIC CORE	23-030	SCH
2	SURFACE CLOSER	4040XP SCUSH	LCN
2	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MULLION SEAL	139N PSA	ZER
1	RAIN DRIP	142AA (AS REQ'D)	ZER
2	MEETING STILE	328AA-S (PAIR)	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER
2	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 04

DOOR NUMBER:
111B

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CORRIDOR LOCK	L9456T L583-363	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP SHCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER
1	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 05

DOOR NUMBER:
114

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER

HARDWARE SET: 06

DOOR NUMBER:
130

EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	OH STOP	90S	GLY
1	SURFACE CLOSER	1461SHCUSH	LCN
2	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER
2	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 07

DOOR NUMBER:
128 129

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CLASSROOM DEAD LOCK	L463T	SCH
1	FSIC CORE	23-030	SCH
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4040XP SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER
1	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 08

DOOR NUMBER:
105B 109B

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP 630	IVE
1	CYLINDER DEAD LOCK	L464T	SCH
1	FSIC CORE	23-030	SCH
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4040XP SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA (AS REQ'D)	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	655	ZER
1	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 09

DOOR NUMBER:
118

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 10

DOOR NUMBER:
113

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
1	OH STOP	90S	GLY
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE

HARDWARE SET: 11

DOOR NUMBER:
122

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461REG ARM	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 12

DOOR NUMBER:
111A

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE

HARDWARE SET: 13

DOOR NUMBER:
126

EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
2	OH STOP	90S	GLY
2	KICK PLATE	8400 8" X 2" LDW B-CS	IVE

HARDWARE SET: 14

DOOR NUMBER:
123

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE/ENTRY LOCK	L9050T L583-363	SCH
1	FSIC CORE	23-030	SCH
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 15

DOOR NUMBER:
102A

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
1	OH STOP	90S	GLY
1	SURFACE CLOSER	1461 REG ARM	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE

HARDWARE SET: 16

DOOR NUMBER:
112B

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4040XP REG ARM	LCN
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 17

DOOR NUMBER:
103A 103B 105A 107A 107B 109A

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4040XP EDA	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 18

DOOR NUMBER:
201A 201B

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	CLASSROOM DEAD LOCK	L463T	SCH
1	FSIC CORE	23-030	SCH
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4040XP SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE

HARDWARE SET: 19

DOOR NUMBER:
102B 117

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PRIVACY LOCK	L9440 L583-363 OS-OCC	SCH
1	SURFACE CLOSER	4040XP REG ARM	LCN
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 20

DOOR NUMBER:
124

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 21

DOOR NUMBER:
204

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 REG ARM	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 21.1

DOOR NUMBER:
125A

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PANIC HARDWARE	LD-98-L-NL	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE

HARDWARE SET: 22

DOOR NUMBER:
205

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 EDA	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKETING	188SBK PSA	ZER

HARDWARE SET: 23

DOOR NUMBER:
127C

EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
2	OH STOP	90S	GLY

HARDWARE SET: 24

DOOR NUMBER:
202

EACH TO HAVE:

6	HINGE	5BB1 4.5 X 4.5	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	STOREROOM LOCK	L9080T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	1461 REG ARM	LCN
2	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
2	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: 25

DOOR NUMBER:
119A

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	POWER TRANSFER	EPT10	VON
1	EU MORTISE LOCK	L9092TEU	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP SCUSH	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	CREDENTIAL READER	BY SECURITY/ACCESS CTRL SYSTEMS	
1	DOOR CONTACT	679-05HM	SCE
1	POWER SUPPLY	PS902	VON

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HARDWARE SET: 26

DOOR NUMBER:
112A
CASED OPENING TO RECEIVE NO HARDWARE.

HARDWARE SET: 27

DOOR NUMBER:
111C
ALL HARDWARE BY OVERHEAD/COILING DOOR SYSTEM MANUFACTURER/SUPPLIER.

HARDWARE SET: AL-01

DOOR NUMBER:
101A 101B 116A

EACH TO HAVE:

2	CONT. HINGE	112XY	IVE
2	DUMMY PUSH BAR	350	VON
2	STRAIGHT DOOR PULL	9266F O (8” LESS DOOR HEIGHT) *	IVE
2	OH STOP	100S	GLY
2	SURFACE CLOSER	4021	LCN
1	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

*DOOR PULL TO BE FULL HEIGHT OF THE DOOR LESS 8”. MOUNT 4” BELOW TOP OF DOOR. BACKSET STRAIGHT PULL +/- 4-1/2” TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE. MATCH SAME BACKSET ON ADJACENT LEAF.

HARDWARE SET: AL-02

DOOR NUMBER:
115A 127A 127B 200A

EACH TO HAVE:

2	CONT. HINGE	112XY	IVE
1	PANIC HARDWARE	CD-9847-EO-LBR	VON
1	PANIC HARDWARE	CD-9847-NL-OP-LBR-110MD	VON
1	RIM CYLINDER	20-057 ICX	SCH
2	MORTISE CYLINDER	20-061 ICX	SCH
3	FSIC CORE	23-030	SCH
2	STRAIGHT DOOR PULL	9266F O (8” LESS DOOR HEIGHT) *	IVE
2	OH STOP	100S	GLY
2	SURFACE CLOSER	4021	LCN
1	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

*DOOR PULL TO BE FULL HEIGHT OF THE DOOR LESS 8”. MOUNT 4” BELOW TOP OF DOOR. BACKSET STRAIGHT PULL +/- 4-1/2” TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE. MATCH SAME BACKSET ON ADJACENT LEAF.

HARDWARE SET: AL-03

DOOR NUMBER:
121

EACH TO HAVE:

1	CONT. HINGE	112XY	IVE
1	CLASSROOM LOCK	L9070T	SCH
1	FSIC CORE	23-030	SCH
1	SURFACE CLOSER	4040XP REG ARM	LCN
1	MOUNTING PLATE	4040XP-18 SRT	LCN
1	FLOOR STOP	FS439	IVE

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

HARDWARE SET: AL-04

NOT USED

HARDWARE SET: AL-05

DOOR NUMBER:
115B

EACH TO HAVE:

1	CONT. HINGE	112XY	IVE
1	PANIC HARDWARE	CD-98-NL-OP	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	MORTISE CYLINDER	20-061 ICX	SCH
2	FSIC CORE	23-030	SCH
1	DOOR PULL	9266F O 18" *	IVE
1	OH STOP	100S	GLY
1	SURFACE CLOSER	4021	LCN
1	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN
1	THRESHOLD	655	ZER
1	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

*BACKSET STRAIGHT PULL +/- 4-1/2" TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE.

HARDWARE SET: AL-06

DOOR NUMBER:
106A 106B

EACH TO HAVE:

2	CONT. HINGE	112XY	IVE
1	CONST LATCHING BOLT	FB51P (HMD)	IVE
1	DUST PROOF STRIKE	DP1	IVE
1	CYLINDER DEAD LOCK	L464T	SCH
2	DUMMY PUSH BAR	350	VON
1	FSIC CORE	23-030	SCH
2	STRAIGHT DOOR PULL	9266F O (8" LESS DOOR HEIGHT) *	IVE
2	OH STOP	100S	GLY
2	SURFACE CLOSER	4021	LCN
1	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN
1	THRESHOLD	655	ZER
2	DOOR CONTACT	679-05HM	SCE

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

*DOOR PULL TO BE FULL HEIGHT OF THE DOOR LESS 8". MOUNT 4" BELOW TOP OF DOOR. BACKSET STRAIGHT PULL +/- 4-1/2" TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE. MATCH SAME BACKSET ON ADJACENT LEAF.

HARDWARE SET: AL-07

DOOR NUMBER:
119B

EACH TO HAVE:

1	CONT. HINGE	112XY EPT	IVE
1	POWER TRANSFER	EPT10	VON
1	ELEC PANIC HARDWARE	QEL-98-NL-OP	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	FSIC CORE	23-030	SCH
1	OH STOP	100S	GLY
1	DOOR PULL	9266F O 18" *	IVE
1	SURFACE CLOSER	4021	LCN
1	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN
1	THRESHOLD	655	ZER
1	CREDENTIAL READER	BY SECURITY/ACCESS CTRL SYSTEMS	
1	DOOR CONTACT	679-05HM	SCE
1	POWER SUPPLY	PS902 900-4RL	VON

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

*. BACKSET STRAIGHT PULL +/- 4-1/2" TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE.

HARDWARE SET: AL-08

DOOR NUMBER:
100A

EACH TO HAVE:

2	CONT. HINGE	112XY EPT	IVE
2	POWER TRANSFER	EPT10	VON
2	ELEC PANIC HARDWARE	QEL-9847-EO	VON
2	STRAIGHT DOOR PULL	9266F O (8" LESS DOOR HEIGHT) *	IVE
2	OH STOP	100S	GLY
2	SURFACE CLOSER	4021	LCN
2	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN
1	THRESHOLD	655	ZER
2	DOOR CONTACT	679-05HM	SCE
1	POWER SUPPLY	PS902 900-4RL	VON

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

*DOOR PULL TO BE FULL HEIGHT OF THE DOOR LESS 8". MOUNT 4" BELOW TOP OF DOOR. BACKSET STRAIGHT PULL +/- 4-1/2" TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE. MATCH SAME BACKSET ON ADJACENT LEAF.

HARDWARE SET: AL-09

DOOR NUMBER:
100B 116B

EACH TO HAVE:

2	CONT. HINGE	112XY EPT	IVE
2	POWER TRANSFER	EPT10	VON
1	ELEC PANIC HARDWARE	QEL-9847-EO	VON
1	ELEC PANIC HARDWARE	QEL-9847-NL-OP-110MD	VON
1	RIM CYLINDER	20-057 ICX	SCH
1	FSIC CORE	23-030	SCH
2	STRAIGHT DOOR PULL	9266F O (8” LESS DOOR HEIGHT) *	IVE
2	OH STOP	100S	GLY
2	SURFACE CLOSER	4021	LCN
2	MOUNTING PLATE	4020-18/18G SRT (AS REQ'D)	LCN
1	THRESHOLD	655	ZER
1	CREDENTIAL READER	BY SECURITY/ACCESS CTRL SYSTEMS	
2	DOOR CONTACT	679-05HM	SCE
1	POWER SUPPLY	PS902 900-4RL	VON

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
BALANCE OF EAC COMPONENTS BY ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

*DOOR PULL TO BE FULL HEIGHT OF THE DOOR LESS 8”. MOUNT 4” BELOW TOP OF DOOR. BACKSET STRAIGHT PULL +/- 4-1/2” TOWARDS HINGE EDGE TO AVOID BLOCKING CYLINDER HOLE. MATCH SAME BACKSET ON ADJACENT LEAF.

END OF SECTION 087100

SECTION 08 8000
GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

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 08 1416 - Flush Wood Doors: Glazed doors. Glazing furnished by door manufacturer.

C. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

D. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing furnished by curtain wall manufacturer.

E. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Framed Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

H. ASTM C1376 - Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

K. GANA (GM) - GANA Glazing Manual; 2022.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Provide compatibility testing of IGU edge seal with glazing compounds and setting blocks, and submit results of testing.

E. Product Data on Decorative Privacy Glazing Film for specified product.

F. Samples:

1. Submit two samples 12x12 inch in size of glass units, showing coloration and design, for selection purposes.

G. Shop Drawing showing plan & elevation of doors to receive film with installation orientation and dimensions.

H. Manufacturer's operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods for Decorative Privacy Glazing Film.

I. Certificates: Certify that products meet or exceed specified requirements.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

B. Labeling: Furnish each pane of fire resistance-rated glazing and each pane of safety glazing with a permanent identification which meets the requirements of the latest approved edition of the International Building Code.

C. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual", and SIGMA TM-3000, "Vertical Glazing Guidelines", except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this secton or other referenced standards.

D. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

E. Fire Resistance Rated Glass: Provide glass products that meet CPSC 16 CFR 1201, Category II requirements for fire-rated glass and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

F. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of the inspecting and testing organization indicated below.
1. Insulating Glass Certification Council (IGCC).
a. ASTM E 2190.

G. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.07 MOCK-UP

A. Include Glazing in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Replacements Under Warranties: Provide same warranty as original glass and glazing, beginning from date of replacement completion for glass units replaced under Warranty provisions.

PART 2 - PRODUCTS

2.01 INSULATING GLASS UNITS

A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing, low-E.
1. Application: All exterior glazing unless otherwise indicated.
2. Basis of Design: Sunguard SNE 50/25 by Guardian.

3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: As selected.
   b. Coating: Low-E (solar control type), on #2 surface.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
6. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.
7. Total Thickness: 1 inch.
8. Total Visible Light Transmittance: 34 percent, nominal.
9. Total Solar Heat Gain Coefficient: 21 percent, nominal.
10. Light to Solar Gain ratio (LSG): 1.62.
11. Glazing Method: Gasket glazing.

B. Type IG-2 - Sealed Insulating Glass Units: Safety glazing:
1. Applications: Provide this type of glazing in the following locations:
   a. Glazed lites in exterior doors.
   b. Glazed sidelights and panels next to doors.
   c. Other locations required by applicable federal, state, and local codes and regulations.
   d. Other locations indicated on the drawings.
2. Type: Same as other vision glazing except use fully tempered float glass for both outboard and inboard lites.
3. Edge Spacer: See "Sealed Insulating Glass Units" Article below.
4. Edge Spacer Color: See "Sealed Insulating Glass Units" Article below.

C. Type IG-3 - Sealed Insulating Glass Units: Spandrel glazing.
1. Application: Exterior glazing where indicated.
2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
   a. Tint and coating, same as other sealed insulated glass units.
3. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
   a. Tint: Clear.
   b. Opacifier: Ceramic frit, on #4 surface.
   c. Opacifier Color: As selected by Architect.
4. Total Thickness: 1 inch.
5. Glazing Method: Gasket glazing.

D. Type S-1 - Single Vision Glazing:
1. Application: All interior glazing unless otherwise indicated.
2. Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch.
5. Glazing Method: Gasket glazing.

E. Type S-2 - Fire-Protection-Rated Glazing:
1. IBC Fire Protection Rating: D-H-T-90 or W-90, minimum.
2. Safety Certification: 16 CFR 1201 Category II.
3. Application: Provide this type of glazing in the following locations:
   a. Glazed lites in fire doors.
   b. Fire windows.
   c. Sidelights, borrow lites, and other glazed openings in partitions indicated as having an hourly fire rating.
   d. Other locations indicated on the drawings.
4. Fire Rating: As indicated on the drawings.
5. Type: Glass-ceramic safety glazing.
6. Thickness: 1/4 inch.
7. Glazing Method: As required for fire rating.

F. Type S-3 - Single Safety Glazing: Non-fire-rated.
   1. Application: Provide this type of glazing in the following locations:
      a. Glazed lites in doors, except double glazed lites in doors, and fire doors.
      b. Glazed sidelights to doors, except in double glazed sidelites, fire-rated walls and partitions.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on the drawings.
   2. Type: Fully tempered float glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch.
   5. Glazing Method: Gasket glazing.

2.02 EXTERIOR GLAZING ASSEMBLIES

A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
   1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Glass thicknesses listed are minimum.

2.03 GLASS MATERIALS

A. Float Glass Manufacturers:
   1. AGC Glass Company North America, Inc: www.us.agc.com.
   2. Guardian Industries Corp: www.sunguardglass.com.
   3. Pilkington North America Inc: www.pilkington.com/na.
   4. PPG Industries, Inc; [Basis of Design]: www.ppgideascapes.com.
   5. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
   3. Thicknesses: As indicated; for exterior glazing comply with specified requirements indicated for wind load design regardless of specified thickness.

C. Fire-Protection-Rated Glazing: Type, thickness, and configuration as required to achieve indicated ratings.
   1. IBC Fire Protection Rating: As indicated on drawings.
   2. Provide products listed by Underwriters Laboratories or Intertek Warnock Hersey.
   3. Labeling: Provide permanent label on each piece giving the IBC rating and other information required by the applicable code.

D. Fire-Protection-Rated Glazing:
   1. IBC Fire Protection Rating: D-H-T-90 or W-90, minimum.

E. High Impact-Resistant Tempered Safety Glazing: Complying with 16 CFR 1201 test requirements for Category II.

F. Glass-Ceramic Safety Glazing: UL- or WH-listed as fire-protection-rated glazing and complying with 16 CFR 1201 test requirements for Category II without the use of a surface-applied film.

G. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.

H. Mirror Glass : ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); silvering, protective coating and physical characteristics complying with ASTM C1503; 6 mm minimum thick.
   1. Sizes noted on Drawings.

2.04 SEALED INSULATING GLASS UNITS

A. Manufacturers:
   1. Any of the manufacturers specified for float glass.

2. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
3. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Sealed Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Edge Spacers: Aluminum, bent or soldered corners.
3. Edge Spacer Color: As selected by Architect.
4. Edge Seal: Glass to elastomer with supplementary silicone sealant.
5. Purge interpane space with dry argon air.

2.05 GLAZING COMPOUNDS

A. Manufacturers:
1. Bostik Inc: www.bostik-us.com.
2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
3. Pecora Corporation: www.pecora.com.
4. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
5. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

C. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

D. Acrylic Sealant: Single component, solvent curing, non-bleeding; ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; with cured Shore A hardness range of 15 to 25; color as selected.

E. Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

F. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; color as selected.

G. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.06 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; color as selected.

E. Glazing Clips: Manufacturer's standard type.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

E. Trim protruding tape edge.

3.05 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.
   1. Place glazing tape on glazing pane of unit with tape flush with sight line.

F. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.

G. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

H. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.07 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.08 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

B. Locate and secure glazing pane using glazers' clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.09 INSTALLATION - MIRRORS

A. Install mirrors in accordance with GANA recommendations.

B. Install mirrors in correctly sized openings, using setting blocks (neoprene 80 to 90 Shore A durometer hardness), spacer shims, stainless steel clips, and adhesive compatible with mirror coating and wall substrate.

C. Set mirrors plumb and level, free of optical distortion.

D. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.10 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.11 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.12 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

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SECTION 08 9100
LOUVERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

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 6200 - Sheet Metal Flashing and Trim.

C. Section 07 9005 - Joint Sealers.

D. Division 23 - Mechanical Sections.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

D. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

F. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; 2020.

G. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

H. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

I. ASTM D2244 - Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.

J. FEMA 361 - Design and Construction Guidance for Community Safe Rooms.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

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.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty against distortion, metal degradation, and failure of connections.

C. Finish: Provide twenty year warranty against degradation of exterior finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
1. Airolite Company, LLC : www.airolite.com.
2. Construction Specialties, Inc: www.c-sgroup.com.
3. Greenheck: www.greenheck.com
4. Nystrom: www.nystrom.com.
5. Ruskin Company: BASIS OF DESIGN www.ruskin.com.

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 without damage or permanent deformation.
2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers : Horizontal blade, extruded aluminum construction, with concealed intermediate mullions. Storm resistant.
1. Manufacturers:
a. Greenheck
b. Ruskin
2. Free Area: 57 percent, minimum.
3. Blades: Drainable.
4. Frame: 6 inches deep nominal, channel profile; corner joints mitered and, with continuous recessed caulking channel each side, and extended subsill.
5. Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M) .

B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.

C. Insect Screen: 18 x 16 size aluminum mesh.

D. Primer: Zinc chromate, alkyd type.

2.04 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer's full line, if not indicated on drawings.

2.05 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Fasteners and Anchors: Stainless steel.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. Install perimeter sealant and backing rod in accordance with Section 07 9005.

F. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

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SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Metal channel ceiling framing.

C. Shaft wall system.

D. Fire rated area separation walls.

E. Fiber reinforced backing board.

F. Gypsum wallboard.

G. Moisture-Resistant board.

H. Glass mat faced gypsum board sheathing.

I. High-Impact gypsum board.

J. Joint treatment and accessories.

K. Bullet resistant sheathing and wallboard.

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 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 1400 - Fluid-Applied Air Barrier: Water-resistive barrier and air barrier over sheathing. Sealant for sheathing on which fluid-applied waterproofing will be applied.

D. Section 07 2100 - Th erma: Acoustic insulation.

E. Section 07 2400 - Exterior Insulation and Finish Systems: Water Resistive Barrier over exterior wall sheathing.

F. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

G. Section 07 9005 - Jo intS: Acoustic sealant.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

H. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

I. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018 (Reapproved 2023).

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

M. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

N. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2019.

O. GA-238 - Guidelines for the Preventions of Mold Growth on Gypsum Wallboard; 2003.

P. GA-253 - Recommended Specifications for the Application of Gypsum Sheathing; Gypsum Association; 1999.

Q. GA-600 - Fire Resistance and Sound Control Design Manual; 2021.

R. GA-801 - Handling and Storage of Gypsum Panel Products: A Guide For Distributors, Retailers, and Contractors; 2007.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

D. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
   1. Maintain one copy of standards at project site.
   2. Where indicated, provide materials and construction which are identical with those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

B. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

C. Single Source Responsibility: Comply with one of the following:
   1. Obtain all steel framing and all metal trim from a single manufacturer.
   2. Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
   3. Provide a confirmation letter from both the gypsum board manufacturer and the joint compound manufacturer that their products are compatible and warrantable if used together.

D. Pre-Construction Conference: Prior to beginning work associated with roof system, the Contractor and appropriate subcontractors shall meet to discuss coordination of the work of the trades associated with the installation of the roof system, suspended acoustical and gypsum board ceiling, suspended mechanical ductwork, suspended light fixtures, etc. This work shall be planned and coordinated to provide hanger attachments needed by the various trades in a manner that will minimize conflict with installation of the roof system.

1.06 MOCK-UP

A. Include Gypsum Board Asemblies in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies as indicated on drawings.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. When materials are moved into the building, distribute pallets and loads evenly around work areas so as to avoid overloading structure, causing damage to any materials, interfering with work of other trades, etc.

D. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads, trim, etc.

PART 2 - PRODUCTS

2.01 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
1. Aegis Metal Framing, LLC.
2. ClarkDietrich Building Systems: www.clarkdietrich.com.
3. Marino/WARE Industries, Corp.: www.marinoware.com.
4. MBA Metal Framing: www.mbastuds.com.
5. SEMCO, Southeastern Metals, Div of Gibraltar Industries.
6. Steel-Con; Div. of Steel Construction Systems.
7. Telling Industries, LLC.

B. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf. Install with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and minimum depth as follows:
1. Metal studs at interior partitions shall have web depth of 3-5/8-inches or 6-inches at locations indicated on the drawings, and a minimum base metal thickness of 0.0296-inches, spaced at 16-inches o.c., unless indicated otherwise below or otherwise shown on drawings or required by project conditions. EQ studs allowed for spans up to 16'-0" vertically when 3rd party test data (e.g. ICC-ES report) is provided.
2. Jamb studs shall be no less than 20 gauge.
   a. Studs shall be joined together at 4'-0" intervals.
3. Use double studs or 6-inch studs, as indicated or as otherwise required, for chase walls, piping, conduits, or etc.
4. Special stud tracks for curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK.
5. Runners: U shaped, sized to match studs.
6. Ceiling Channels: C-shaped.
7. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
8. Resilient Furring Channels: 1/2 inch depth, 25 gauge minimum, for attachment to substrate through one leg only.

C. Exterior Non-Loadbearing Studs and Furring for Application of Gypsum Board: As specified in Section 05 4000.

D. Loadbearing Studs for Application of Gypsum Board: As specified in Section 05 4000.
1. Studs: C-shaped with knurled or embossed faces.
2. Any interior load-bearing studs shall be at least 6-inches depth x 18 gauge, or 8-inches x 18 gauge, unless otherwise indicated on Drawings - galvanized C-studs spaced at 16-inches o.c.

E. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
1. Metal shaft wall studs at interior shaft walls shall be 2-1/2 inches x 25 gauge, 4 inches x 20 gauge, or 6 inches x 20 gauge at locations indicated on the Drawings, spaced in compliance with the required UL Assembly Number, unless otherwise shown on drawings or required by project conditions. C-H and C-T shaftwall studs are acceptable.

F. Steel Framing Components for Suspended and Furred Ceilings:
1. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.
2. Wires for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.
3. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
4. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth

as follows:
a. Thickness: 20 gauge, unless otherwise indicated.
b. Depth: As indicated.
c. Spacing: As indicated in referenced standard and on drawings, but no less than at all edges and 24-inches o.c.

5. Steel Rigid Furring Channels: ASTM C645, hat-shaped, depth of 7/8-inch, and minimum thickness of base (uncoated) metal as follows:
   a. Thickness: 20 gauge at interior and 18 gauge at exterior, unless otherwise indicated.
   b. Spacing: As indicated in referenced standard and on drawings, but not less than at all edges and 16-inches o.c.
      1) At ceilings and soffits indicated to receive more than a single layer of gypsum board, spacing shall be not less than at all edges and 16-inches o.c.
6. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.
   a. Locations for Use: Provide grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system; Minimum 4-feet x 4-feet grid and cross tees at 2-feet o.c., with minimum installation requirements as required by manufacturer's current written instructions, referenced standards, and as indicated in this Section and Section 09 5100 - "Suspended Acoustical Ceilings". Provide and comply with manufacturer's published requirements for accessories, trim and hanger wire, and as otherwise required to provide flat ceilings without deflection or sag.
   b. Product/Manufacturer: Provide suspended modular grid furring system equivalent to standard drywall suspension system for flat ceilings, with 1-1/2-inch grid faces, and as follows:
      1) Equivalent to "Drywall Suspension System", as manufactured by USG Interiors, or one of the other above named manufacturers.

G. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.
1. Bottom Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, unpunched unless otherwise indicated, of size, shape and gauge indicated, with 1-5/16-inch flange.
2. Deflection Track: Typical at stud walls up to slab or similar fixed structure at top of walls: Provide for no less than 1" of vertical movement, equivalent to one of the following:
   a. Deep Leg Track System
   b. Track-Over-Track System
   c. Slotted Track System
3. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK.
4. Special stud tracks for all arched walls shall be equivalent to "Flex-C Arch" galvanized flexible segmented track with slidable straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK.
5. Provide deflection track at exterior wall and floor-to-floor walls - typical.

H. Continuous Horizontal Bridging/bracing:
1. 1-1/2-inch cold-rolled channels (galvanized); 0.0538-inch minimum bare metal G60.
2. Spacing: 4'-0" or 4'-6" o.c. vertically, through pre-punched slots in studs.
3. Splice Plates: 16 gauge at all splices.
4. Anchors (bridging channels to studs): 1-1/2-inches x 2-inches x 16 gauge clip angle, 1/4-inch less than stud width, secured with four (4) 5/8-inch S-14 screws. (Anchors required at ends of runs, where snap-in fit to stud slots is not snug or allows stud to move/slide on channels, and at studs on each side of splices in bridging channels).

I. Strap Bracing/Blocking: 16 gauge steel flat strapping/blocking, minimum 6" width. Provide with manufacturer's recommended attachment.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Georgia-Pacific Corp.
   3. Gold Bond Building Products Div., National Gypsum Company.
   4. Lafarge Gypsum.
   5. United States Gypsum Company.

B. Impact Resistant Wallboard:
   1. Application: High-traffic areas indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
   4. Type: Fire-resistance-rated Type X, UL or WH listed.
   5. Thickness: 5/8 inch.
   6. Edges: Tapered.
   7. Products:
      a. National Gypsum Company; Gold Bond Hi-Impact Brand XP Wallboard.
      b. Sheetrock brand Mold Tough VH1 Firecode gypsum panels.
      c. Temple-Inland Building Product by Georgia-Pacific, LLC; ComfortGuard IR Impact Resistant.

C. Gypsum Wallboard: Paper-faced as defined in ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut, and as follows:
   1. Application: Use for vertical surfaces and horizontal surfaces, unless otherwise indicated.
   2. Fire Resistant Type: Type X board (UL or WH listed) at all locations, unless other type is required by indicated tested assembly.
   3. Thickness (unless indicated otherwise):
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 1/2 inch.
   4. Edges: Tapered.

D. Moisture and Mold-Resistant Paper-Faced Products:
   1. Core Type: Type X.
   2. Thickness: 5/8 inch.
   3. Edges: Tapered.
   4. Application: At rooms with toilet fixtures and/or service sinks, entire wall behind sinks, and elsewhere as indicated or wherever water-resistant gypsum board is indicated.
   5. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
   6. Product:
      a. Georgia Pacific ToughRock Mold-Guard.
      b. USG Sheetrock brand "Mold Tough" gypsum panels.
      c. Substitutions: See Section 01 6000 - Product Requirements.

E. Backing Board For Tile:
   1. Fiber-Reinforced Gypsum Panels: As defined in ASTM C1278, mold-resistant, and with water-resistant core. No paper face.
   2. Thickness: 5/8 inch.
   3. Product:
      a. Georgia Pacific "DensShield Tile Backer".
      b. USG Fiberock brand "Aqua-Tough" Tile backerboard.
      c. Substitutions: See Section 01 6000 - Product Requirements.
   4. Application: Wall surfaces behind tile.

F. Gypsum Exterior Sheathing Board: Glass Mat gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face, back and long edges with glass mats; complying with ASTM C 1177 and requirements indicated below:

1. Type: Type X at all locations. (Noncombustible.)
2. Edge and End Configuration: Square.
3. Thickness: 5/8-inch, unless indicated otherwise.
4. Size: 4'-0" x 8'-0" or 9'-0" as required for coordination with framing.
5. Products:
   a. Georgia Pacific "DensGlass Sheathing".
   b. CertainTeed Gypsum "GlasRoc Sheathing".
   c. Continental Building Products: www.continental-bp.com "Weather Defense Platinum Type X".
   d. Gold Bond "eXP Extended Exposure Sheathing".
   e. USG "Securock Exterior Sheathing".
6. Joints: Sealed and facing-taped joints. Polyurethane joint sealant reinforced with fiberglass mesh tape encapsulated in the sealant. Sheathing fastener heads shall be encapsulated with polyurethane sealant. Fiberglass reinforcement is not needed at sheathing fastener heads. NO acrylic latex sealant shall be used.
7. Extent: For Exterior sheathing, where plywood or other wood sheathing is not indicated.

2.03 GYPSUM BOARD ACCESSORIES

A. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.

B. Extruded Moldings and Reveal Moldings: Provide manufacturer's standard alloy 6063-T5 extruded units with 70% resin 2-coat "Kynar 500" baked enamel finish, and as follows:
   1. Design: Provide shapes and configurations as indicated on the Drawings.
      a. Form reveal moldings to cover at least two sides and rear of reveal.
      b. At drywall (or plaster) edge, provide continuous expanded metal edge, designed for mudding-in.
      c. At ceiling grid edge, provide continuous edge designed for compatibility with lay-in ceiling grid.
      d. Wall to gypsum ceiling reveal: provide continuous reveal molding equal to Fry Reglet "Z" reveal: with 1/2" wide reveal. Paint to match ceiling.
   2. Color: To match ceiling grid in same room where occurs, unless indicated otherwise, and color as selected by Architect at any exterior locations.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, coated glass fiber tape for joints and corners of glass-mat faced boards, and where recommended by manufacturer. Joint material shall be compatible with and approved by air barrier manufacturer, where applicable.
   2. Tape: 2 inch wide, creased paper tape for joints and corners of paper faced boards, and where recommended by manufacturer.

D. Level 5 Surface System Options:
   1. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
   2. Factory-Applied Skim-Coated Drywall with matching Joint Compound: Rapid Deco Level 5 System by Lafarge.

E. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated or other corrosion resistant material exceeding 800 hour ASTM B117 testing, for exterior locations.

F. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

H. Adhesive for Attachment to Wood, ASTM C557.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.
   1. Environmental Requirements, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840, with gypsum board manufacturer's recommendations, and with adhesive manufacturer's recommendations, for before, during, and after installation.
   2. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40º.
   3. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

3.02 SEQUENCING AND SCHEDULING

A. Sequence installation of gypsum board and sheathing with installation of exterior cladding and roofing to comply with requirements indicated below:
   1. Do not leave gypsum sheathing board exposed to weather after its application for more than one month or, if protected as indicated below, for more than 6 months, unless otherwise warranted by manufacturer:
      a. Cover exterior surface of sheathing with a temporary air infiltration barrier equivalent to 6-mil polyethylene film. Apply covering immediately after sheathing is installed.
      b. Remove covering just prior to installation of asphalt felt, face brick, and similarly applied exterior materials.

3.03 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.04 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.

C. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center minimum.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.
   3. Suspend ceiling hangers from building structural members and as follows:
      a. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
      b. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapeze or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
      c. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

d. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
e. Secure hangers to structural support by connecting directly to structure where possible; otherwise, connect to anchorage devices or fasteners as indicated or required.
f. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
g. Do not attach hangers to steel deck tabs.
h. Do not attach hangers to steel roof deck. Attach hangers to structural members.
i. Do not connect or suspend steel framing from ducts, pipes or conduit.
j. Keep hangers and braces 2-inches clear of ducts, pipes and conduits.
k. Sway-brace suspended steel framing with hangers used for support.
l. Install suspended steel framing components in sizes and at spacing indicated but not less than that required by referenced steel framing installation standard
    1) Wire Hangers: 12 gauge, 4-feet on center. Install supplementary hangers as necessary at ceiling fixtures to provide a hanger at each corner of each fixture, diffuser, grille, and other ceiling-mounted equipment.
m. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track.

4. Install bracing as required at exterior locations to resist wind uplift.

D. Studs: Space studs at 16 inches on center.
1. Extend partition framing to structure in all locations unless otherwise indicated.
2. Installation Tolerances: Install each steel framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.
3. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
4. Extend non-bearing wall partition framing to 6 inches above adjacent ceiling heights, except where partitions are indicated to terminate at suspended ceilings.
    a. Provide studs up to tie to structure at 4'-0" o.c. minimum, from partitions terminating below ceilings
5. Install steel studs and furring in sizes and at spacings, indicated but not less than that required by referenced steel framing installation standard.
6. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.
7. Install horizontal steel bridging/bracing in all walls, and the additional strap bracing at curved walls as steel framing progresses. Install in compliance with stud manufacturer's recommendations, at spacing indicated
    a. Galvanized steel strap bracing shall be provided continuous at top and bottom runner tracks and at bridging locations at all curved stud walls.
8. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:
    a. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
    b. Where partition and wall framing abuts overhead structure:
        1) Unless framing is specifically indicated to terminate below ceilings, all framing and gypsum board shall extend up to bottom of structure above.
9. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
10. Install runners (tracks) at floors, ceilings and structural walls and columns, where gypsum drywall stud system abuts other construction.

E. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

1. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    a. Extend vertical jamb studs (double studs-typical) through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.
2. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
3. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32-inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

F. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
1. Orientation: Horizontal.
2. Spacing: At 16 inches on center minimum.

G. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.

H. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame openings, toilet accessories, hardware, and heavy trim, shelving, furnishings and equipment services. Attach metal blocking to studs using manufacturer's recommended method. Bolt or screw steel channels to studs. Utilize 16 gauge flat strapping/blocking minimum 6" width. For all other trades, comply with Section 06 1000 for wood blocking.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. General application and finishing of gypsum Board:
1. Cut boards as recommended by manufacturer.
2. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24-inches in alternate courses of board.
3. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24- inches.
4. Install wall/partitions boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.
5. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.
6. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
7. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
8. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
    a. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except inside double or chase walls which are required to be braced internally.
        1) Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
        2) Fit gypsum board around ducts, pipes, and conduits.

3) Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.

b. Fire-stop around penetrations as required by Codes and authorities having jurisdiction. Refer to Section 07 8400 for additional information and requirements

9. Where interior partitions are indicated to extend to the structure above, the drywall shall also extend to the structure with the same number of layers as required below the ceiling.
10. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 1/2-inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.
11. Gypsum panels applied to walls shall be applied with the bottom edge spaced a minimum of 1/4-inch above the floor.
12. At all interior walls, seal construction at perimeters of partition, partition intersections, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.
    a. Offset boxes and similar openings minimum of one stud space, and insulate behind openings.
    b. Openings cut into wall for boxes shall leave maximum gap of 1/4" around box.
    c. Seal around box completely with acoustical sealant, or gasket recommended by manufacturer for acoustic isolation.
13. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations

C. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
    1. Install gypsum wallboard as follows:
        a. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
        b. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated or required for fire or smoke resistive rated assemblies. Provide maximum length panels, to minimize end joints.
        c. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
    2. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:
        a. Fasten with screws

D. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
    1. Install gypsum backing board for base layer and gypsum wallboard for face layer.
    2. On ceilings apply base layer(s) prior to base layer application on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10-inches. Apply base layers at right angles to supports unless otherwise indicated.
    3. On partitions/walls apply base layer(s) and face layers vertically (parallel to framing) with joints of base layers over supports and face layer joints offset at least one stud or furring member space from base layer joints.
    4. Multi-Layer Fastening Methods:
        a. Apply base layer(s) of gypsum board and face layer to base layer(s) as follows:
        b. Fasten both base layer(s) and face layer separately to supports with screws

E. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

F. Exterior Sheathing: Comply with ASTM C 1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

1. Fasteners spaced approximately 8-inches o.c. and set back 3/8-inch minimum from edges and ends of boards.
2. Cut boards at penetrations, edges and other obstructions of the work; fit tight against abutting work, except provide 3/8-inch setback where non-loadbearing work abuts structural elements at head and jambs.
3. Coordinate installation of sheathing with installation of flashing and joint sealers so that these combined materials are installed in the sequence and manner which prevents exterior moisture from passing through complete exterior wall assembly to the interior.
4. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
5. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match spacing of structural support elements

G. Fiber-Reinforced Gypsum Panels: Install in strict accordance with manufacturer's instructions.

H. Glass Mat Faced Gypsum Board: Install in strict accordance with manufacturer's instructions.

I. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

J. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
1. Single-Layer Applications: Adhesive application.
2. Double-Layer Application: Install base layer using screws. Install face layer using adhesive.

K. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

L. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Control Joints: Place control joints consistent with lines of building spaces, as indicated on drawings or as follows:
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
2. At exterior soffits, not more than 30 feet apart in both directions.
3. Install control joints at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

C. Corner Beads: Install at external corners, using longest practical lengths.

D. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.07 JOINT TREATMENT

A. General: Apply treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
1. Joint tape and joint compound shall be compatible with waterproofing subsequently applied.

C. Fiber Reinforced Gypsum and Cement Board: Use alkali-resistant glass fiber tape, recommended by manufacturer, embedded in latex-fortified mortar or latex-based Type 1 mastic over the joint. Use same material as specified for tile setting.

D. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

5. Level 0: Temporary partitions.

E. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
3. Taping, filling, and sanding are not required at base layer of double-layer applications.

F. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

G. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

H. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:
1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

I. Water-Resistant Gypsum Board and Exterior Gypsum Board: Finish joints between water-resistant backing board with tape and setting-type joint compound to comply with gypsum board manufacturer's written recommendations and installation standards referenced in related sections.

J. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing, except where finishing is required to achieve fire-resistance rating, sound rating or to act as air or smoke barrier

K. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
1. Option: Rapid Deco Level 5 System by Lafarge North America.

3.08 CLEANING AND PROTECTION OF WORK

A. Promptly remove any joint compound and adhesives and similar residue from adjacent surfaces, as it may occur.

B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction remain without damage or deterioration at time of Substantial Completion.

3.09 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.10 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.

B. Level 2: Utility areas and areas behind cabinetry.

C. Level 3: Walls scheduled to receive textured wall finish.

D. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.

E. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

END OF SECTION

SECTION 09 3000
TILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Tile for shower receptors.

D. Ceramic trim.

E. 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 - Gy psum: Description and installation of tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017 (Reaffirmed 2022).
   2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.
   3. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2021).
   4. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
   5. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2019.
   6. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2021.
   7. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
   8. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
   9. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
   10. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
   11. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
   12. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
   13. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
   14. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
   15. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

16. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives. Include test results where indicated.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on one plywood panel, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Samples: Submit two each 3 by 3 inch tile samples for color and product verification.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 2 percent of each size, color, and surface finish combinationbut not less than 10 square feet of each type.

1.06 QUALITY ASSURANCE

A. 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.

PART 2 - PRODUCTS

2.01 TILE

A. Manufacturers:
1. See Drawings for manufacturers.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Porcelain Floor Tile
1. See Drawings for products.
2. Colors, Sizes, and Patterns: See Finish Plan and Finish Legend.

C. Porcelain Wall Tile
1. See Drawings for products.
2. Colors, Sizes, and Patterns: See Interior Elevations and Finish Legend.

D. Floor Tile Coefficient of Friction:
1. Minimum Slip Resistance: Dynamic Coefficient of Friction, per ANSI A137.1-2012, shall be 0.42 (per the DCOF AcuTest) for any tile used on walking surface.

2.02 TRIM AND ACCESSORIES

A. Porcelain/Ceramic Trim: Matching bullnose shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Cove base, unless indicated otherwise.
   2. Manufacturers: Same as for tile.

B. Non-Porcelain/Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile.
      b. Open edges of floor tile.
      c. Wall corners, outside and inside.
      d. Transition between floor finishes of different heights.
         1) Schluter Reno, or as indicated on drawings.
      e. Thresholds at door openings.
      f. Expansion and control joints, floor and wall.
      g. Floor to wall joints.
      h. Borders and other trim as indicated on drawings.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Genesis APS International: www.genesis-aps.com/#sle.
      c. Substitutions: See Section 01 6000 - 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. StarQuartz Industries, Inc.: www.StarQuartz.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Grout: 100% solids epoxy grout as specified in ANSI A118.3 - most current standard.
   1. Colors: To be selected by Architect from manufacturer's full range.
   2. Locations: At all locations, unless noted otherwise.

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, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.
   2. Locations for Use: Below all tile flooring, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.

3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Cleavage Membrane: No. 15 asphalt saturated felt; complies with ANSI 108.02-3.8.

B. Vapor Retarder Membrane at Walls: No. 15 (6.9kg) asphalt saturated felt. Complies with ANSI A108.02-3.8.

C. Waterproofing Membrane: Equivalent to "ECB Anti-Fracture Membrane", as manufactured by NAC Products, Inc.; Cuyahoga Falls, Ohio (Phone: 1-800-633-4622).
1. Provide complete system, including substrate primer/sealer, 40-mil, two component, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.
2. Locations for Use: Below all tile flooring, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.
3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.

D. Substitutions: Section 01 6000 - Product Requirements.

E. Shower Membrane:
1. OPTION 2: Waterproofing Membrane, and Floor Drain with Integrated Bonding Flange; Consisting of the following components (for use with thinsetting tile):
a. Schluter KERDI: 0.008 inch (o.2mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which meets or exceeds the requirements of the "American National Standard Specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10", and is evaluated by ICC-ES (Report No. ESR-2467).
b. Schluter KERDI-DRAIN (Plastic): Floor drain 11-3/16 inch (300mm) diameter, trapezoid-perforated, sloped integrated bonding flange with thermally laminated polypropylene fleece and grate assembly. Grate assembly includes grate, height adjustment collar, and lateral adjustment ring with trapezoid perforations. Drain listed by UPC to meet requirements of "International Association of Plumbing and Mechanical Officials Interim Guide Criteria for Floor Drain with Integrated Bonding Flange" (IGC 195), referenced in method B422 of TCNA Handbood for Ceramic Tile Installation.
c. Schluter KERDI-SHOWER-SC: Trapezoid-imprinted, prefabricated, tiled shower curb base, made of 2.75 lb/cu ft (44 kg/cu. meter) density self-extinguishing (HF-1 rating per UL-94) expanded polystyrene. Curb dimensions: 48 inch x 6 inch x 4-1/2 inch.

F. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

G. Mesh Tape: 2-inch 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, unless otherwise indicated.

3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. At bathtub walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane.

C. Grout with standard grout as specified above.

3.07 INSTALLATION - WALL TILE

A. Over interior cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244C, using waterproof membrane, and epoxy grout.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

C. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202 thin-set with epoxy bond coat and grout.

3.08 INSTALLATION - SHOWER PANS

A. Over backer board walls and mortar bed floor, install shower receptor in accordance with The Tile Council of North America Handbook Method TR420. Test shower pans.

3.09 CLEANING

A. Clean tile and grout surfaces.

3.10 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.11 SCHEDULE

A. See Finish Schedule on Drawings.

END OF SECTION

SECTION 09 5100
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 07 2100 - Thermal Insulation: Acoustical insulation.

C. Section 07 9200 - Joint Sealers: Acoustic sealant.

D. Section 09 2116 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

G. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

K. 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.

L. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

M. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2021a.

N. ITS (DIR) - Directory of Listed Products; Current Edition.

O. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

P. 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 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 8 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 MAINTENANCE MATERIALS

A. Furnish the following for Owner's use in maintenance of project.

B. See Section 01 6000 - Product Requirements, for additional provisions.

C. Extra Acoustical Units: 200 sq ft of each type and size.

1.07 QUALITY ASSURANCE

A. Single Source Responsibility: Provide acoustical panel units and grid components from the same 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 Bunring 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 Laboratory 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, lighting, HVAC, electrical, and sprinkler systems.

1.08 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

B. Do not install acoustical units in spaces that are unconditioned, where wet work is ongoing, or where the state of completion is essentially suitable for occupancy.

1.09 WARRANTY

A. Acoustical Panels: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failure includes, but is not limited to:
   1. Acoustical Panels: Sagging or warping.
   2. Grid System: Rusting or manufacturer's defects.

B. Warranty Period: Thirty (30) years from the date of Substantial Completion.

C. The Warranty shall not deprive the Owner of other rights it may have under other provisions of the Contract 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 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in original packaging and store indoors in a cool dry environment in strict accordance with the manufacturers printed instructions.

B. Protect materials from damage due to exposure to exterior environments including rain and sunlight, construction activities, and related conditions.

C. Prior to installing acoustical units, allow them to acclimate to the interior environment for a minimum of twenty-four hours.

D. Handle acoustical units carefully to avoid damage from installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Basis of Design: Armstrong World Industries, Inc: www.armstrongceilings.com.
   2. Other Acceptable Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls.
      b. USG Corporation: www.usg.com/ceilings.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Basis of Design: Armstrong World Industries, Inc: www.armstrongceilings.com.
   2. Other Acceptable Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls.
      b. USG Corporation: www.usg.com/ceilings.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. See Finish Schedule for products.

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.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

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 galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

E. Metal Edge Trim for "Cloud" Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
   1. Trim Height: 6 inch.
   2. Finish: Baked enamel.
   3. Color: White.
   4. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

F. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.

G. 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.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

K. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

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.

D. Fit border trim neatly against abutting surfaces.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

I. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

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SECTION 09 6466
WOOD ATHLETIC-FLOORING ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. 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. Allowances - Section 01 2100: Allowances affecting striping and graphics work of this Section.
   3. Concrete and Concrete Finishing - Section 03 3100.
      a. Concrete Slab Depression: 1-3/4” using 25/32” flooring and subfloor for SB System.
      b. Surface Finish: steel troweled and finished smooth.
      c. Concrete Tolerance: 1/8” in radius of 10’.
      d. Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
   4. 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.
   5. Thresholds - Section 08 7100.
   6. 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 Equilibirum 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 (GYM FLOOR)

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
   1. 25/32” thick x 2-1/4” wide, 2nd and Btr Grade, Random length, unfinished TGEM, KD Northern Hard Maple, as manufactured by Robbins and graded in accordance with MFMA rules.

E. Fasteners
   1. Flooring – 1-3/4" cleats or staples.
   2. Subfloor Channel Anchors – Powers SPIKE® anchors.

F. Finishing Materials
   1. Robbins Miracle or approved equal oil-modified polyurethane sealer and finish.

G. Gamelines
   1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.

H. 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.
      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 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

B. ASTM F1859 - Standard Specification for Rubber Sheet Floor Covering Without Backing; 2021a.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit one sample, 9 by 9 inch in size illustrating color and pattern for each resilient flooring product specified, and two 3 by 3 inch samples.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: Provide minimum of 5% of each type and color.
   3. Extra Wall Base: Provide minimum of 5% of each type and color.
   4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

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.

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.
   1. Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68º F (20º 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 to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

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 SHEET FLOORING

A. Heterogeneous Sheet Flooring - Type ____: 100 percent rubber composition, color and pattern through total thickness.
   1. Manufacturers: As indicated on Finish Legend. See drawings
      a. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1859
   3. Thickness: See finish legend

2.02 RESILIENT TILE FLOORING

A. Luxury Vinyl Tile (LVT):
   1. Minimum Requirements: Comply with ASTM F 1700 Class III, Type B - Embossed Surface.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   3. Smoke Developed: 450 or less, when in accordance with ASTM E 662.
   4. Static Load Limit: 250 psi, when tested in accordance with ASTM F 970 (modified).
   5. Size: See Finish Legend.
   6. Wear Layer Thickness: 0.020 inch (nominal).
   7. Total Thickness: See finish legend.
   8. Durability: 0.125 inch - Very Good.
   9. Maintainability: 0.125 inch - Excellent.
   10. Resilience: 0.125 inch - Excellent.
   11. Manufacturer/ Style/ Color: See Finish Legend.

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. Finish: As selected by Architect.
   4. Length: Roll.
   5. Accessories: Premolded external corners.
   6. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com. [basis of design]
      b. Roppe Corporation: 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. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

F. Confirm tiles are square and true. Cull all non-conforming tiles.

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. Installation of resilient tile:
   1. Installer shall dry lay all waterjet designs prior to final installation.
   2. Installer shall notify waterjet company of any concerns prior to final installation.
   3. Install according to manufacturer’s recommendations.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 72 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 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.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.08 SCHEDULE

A. See Drawings.

END OF SECTION

SECTION 09 6566
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 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

C. Section 09 6500 - 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 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, 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.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - 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 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 or to go above 100 degrees F.

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 90
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Homogeneous Polyurethane Flooring System, Type _____:
   1. Total System Thickness: Minimum 23/64 inch.
   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, 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.
      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 90
   1. Total System Thickness: Minimum 1/4 inch; with minimum 0.07 inch 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, 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 09 0561.
   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.

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 wet-into-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.

END OF SECTION

SECTION 09 6723.02
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 (1/8")
   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 10^6 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.℉ 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.

END OF SECTION

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SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

C. Section 09 6500 - Resilient Flooring.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

E. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Accessory Samples: Submit two 6 inch long samples of edge strip, base cap, and stair nosing.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 MAINTENANCE MATERIALS

A. Furnish the following for Owner's use in maintenance of project.

B. See Section 01 6000 - Product Requirements, for additional provisions.

C. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.06 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.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 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. Tile Carpeting:
   1. See Finish Legend and Schedule for manufacturer.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting: Fusion bonded, manufactured in one color dye lot.
   1. Tile Size: As indicated on drawings.
   2. Color: As indicated on drawings.
   3. Pattern: As indicated on drawings..
   4. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
   6. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.
   7. Pile Height: 1/2" maximum.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

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 wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

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. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
F. Locate change of color or pattern between rooms under door centerline.
G. Fully adhere carpet tile to substrate.
H. Trim carpet tile neatly at walls and around interruptions.
I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
C. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09 8400
ACOUSTICAL WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:
   1. Acoustical Wall Panels.

B. Related Sections:
   1. 09 2116 - Gypsum Board Assemblies
   2. 09 5100 - Suspended Acoustical Ceilings

1.02 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for acoustical wall panels, including plans, elevations, sections, details and attachment to other work.

B. Submittals: Furnish 12” x 12” samples, in the shape shown on drawings, showing manufacture's full range of colors, texture and patterns available for each type of acoustical product specified.

C. Product Test Report: From a qualified testing agency indicating wall panels comply with requirements.

D. Qualification Data: For firms specified in “Quality Assurance” Article to demonstrate their capabilities and experience.

E. Product Certificates: Signed by manufacturer certifying that the products furnished comply with requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualification: Manufacture shall have a minimum of 10 years experience in production of specified products and shall furnish supporting documentation showing completed jobs of approximately the same size and scope.

B. Fire Test Reports: Provide acoustical wall panels with the following surface- burning characteristics as per ASTM E 84.
   1. Flame Spread: 25 or less
   2. Smoke Developed: 450 or less

C. Acoustical Test Report: Provide acoustical test report from a qualified testing agency indicating acoustical wall panels meets 0.65 NRC per ASTM C-423.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect Acoustical Wall Panels from excessive moisture when shipping, storing, and handling. Deliver in unopened skids and store in a dry place with adequate air circulation. Do not delivery material until all wet-work has been completed.

1.05 WARRANTY

A. Provide manufacturer's warranty covering panel finish, core.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. AVL Systems, Inc.; "AcousTech" ATP 1.1 High Performance; [Basis of Design]: www.AVLonline.com.

B. Conwed Designscape: www.conweddesignscape.com

C. Kinetics Noise Control : www.kineticsnoise.com

D. Frasch: www.frasch.com

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRODUCTS

A. AWP-2: Frasch "Plank"
   1. Edges: Square.

2. Finish: See Finish Legend.
3. Thickness: 75".
4. NRC: 0.30-0.75.
5. Fire Performance Rating: Class A.
6. Installation Fastener: Per manufacturer's recommendation
7. Location: See Drawings.
8. Size: See Drawings.

B. AWP-1: AcousTech "Endure" High Abuse-Resistant Acoustical Wall and Ceiling Panel ATPE2.1.
1. Edges: Square.
2. Finish: See Finish Legend.
3. Thickness: 2-1/16".
4. Fire Performance Rating: Class A.
5. Installation Fastener: Mechanical (z-clip)
6. Location: See Drawings
7. Size: See drawings

2.03 SUBSTITUTIONS:

A. Acceptance of additional suppliers, manufacturers, and/or products shall be limited to those named, unless others are properly submitted at least 10-days prior to the Original Bid Date and subsequently accepted. See Specification Section 01 6000 - Product Requirements.

2.04 FLAMMABILITY RATING

A. All components shall have a Class A Flammability rating per ASTM E- 84: Surface Burning Characteristics of Building Materials, with a Flame Spread of 25 or less and Smoke Developed of 450 or less.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Acoustical Wall panels in locations indicated, top edges level and in alignment with other panels. Comply with manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.
1. Use Z-clips.

B. Install with minimum 1/8" gap (or gap recommended by manufacturer) between abutting edges to allow for expansion.

3.02 CLEANING

A. After completion of installation of panels, remove dust and other foreign material according to manufactures written instructions.

B. Remove surplus material, rubbish, and debris resulting from panel installation, on completion of the work, and leave areas of installation in a neat and clean condition.

END OF SECTION

SECTION 09 8400
SOUND-ABSORBING CEILING UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Suspended Acoustic Ceiling Baffles.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. Section 05 3100 - Steel Decking: Anchoring panels to steel deck.

C. Section 09 2600 - Gypsum Board Assemblies.

D. Section 09 5110 - Suspended Acoustical Ceilings: Conventional grid-supported acoustic ceilings.

E. Section 09 5426 - Linear Wood Ceilings.

F. Section 09 9000 - Painting.

1.03 REFERENCES

A. ASTM C641 - Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire; 1992.

B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.

C. ASTM C635 - Standard Specifications for Metal Sustension Systems for Acoustical Tile and LAy-in Panel Ceilings.

D. ASTM C636 - Standard Practice for Installation of Metal Panel Ceiling Systems for Acoustical Tile and Lay-in Panels; 1992.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.

F. ASTM E580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 1991.

G. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.

H. AWI (QSI): Architectural Woodwork Quality Standards Illustrated; 2003.

I. CISCA: Ceiling Systems Handbook.

1.04 SUBMITTALS

A. General: Submit manufacturer’s documentation for each type of product under provisions of Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout.

D. Selection Samples: Manufacturer's color charts for applicable material, indicating full range of material, colors, and patterns available.

E. Verification Samples: Fabricated samples of each type of product specified; 6” minimum length and width, showing construction, edge details.

F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

G. Maintenance Materials: Furnish maintenance information and recommendations for Owners use.

1.05 QUALITY ASSURANCE

A. Source Limitations: All similar products to be obtained from a single manufacturer through one source providing a comprehensive material and installation package.

B. Installer Qualifications: Utilization of an installer with demonstrated experience and quality in projects of similar size and complexity, with approval from the ceiling product manufacturer.

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. Ensure all supplied hardware, material, and components are maintained until product is fully installed.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

D. Acclimatize product for minimum 24 hours at temperature and humidity approximately that of occupancy prior to installation.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install materials until spaces are enclosed from the exterior environment, wet work in spaces is complete and dry, and HVAC system is maintaining an ambient temperature at occupancy levels during the remainder of the construction period.

B. Field Measurements: Installer to verify field measurements and dimensions as indicated in Design Submittal.
   1. Coordinate location of other product and trades with product layout.

C. Ensure that Design Submittal signoffs and other required information are supplied in time to prevent interruption of construction process. Ensure that products of this section are supplied to affected trades in time to prevent interruptions.

1.08 WARRANTY

A. Special Warranty: Refer to manufacturer’s standard warranty for specific products, terms, and limitations.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Frasch, www.frasch.com

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTIC CEILING BAFFLE

A. Product: Frasch "Blade Bafl".

B. Material Minimum Performance Attributes:
   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. UL Tested ASTM E-84: Class A
   3. Noise Reduction Coefficient (NRC):
      a. Tested in accordance with ASTM C423 for Type J ceiling mounting, per ASTM E795.
      b. NRC 500hz > 0.61
      c. NRC 1000hz > 0.90
      d. apparent NRC > 0.75

C. Product Attributes:
   1. Baffle Size: See drawings for complete scope and all conditions.
   2. Baffle Thickness: Per product.
   3. Baffle Spacing: See drawings
   4. Color: See drawings.
   5. Edges: Square.
   6. Corners: Square.
   7. Mounting Method: Vertically suspended from roof structure.
      a. Suspended with aircraft cable inserted into integral clips with unistrut

2.03 METAL SUSPENSION SYSTEM

A. Attachment Device: Size for three (3) times the design load indicated in ASTM C625, Table 01, Direct Hung, unless otherwise required.

B. Wire, braces, ties, hanger rods, flat hangers and angle hangers: Provide accessories compliant with applicable ASTM standards.

2.04 FABRICATION

A. General: Fabricate panels to sizes, configurations and patterns as indicated with factory installed hardware.

B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and square-ness from corner to corner.

2.05 ACCESSORIES

A. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations indicated on each baffle unit, sized appropriately for weight of baffle unit.
   1. Contractor to provide and install products as required for baffle installation.
      a. Suspend products at elevations indicated by the Architects drawings and Submittals.
      b. Install products at lengths indicated on drawings
   2. Contractor to select and provide all anchors to building for mounting based on site requirements, conditions, and as appropriate for application.
   3. Provide ceiling mounting points for cable suspension from ceilings.

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 PREPARATION

A. Coordination and Layout: Carefully coordinate the work with all above ceiling trades to ensure end product is a complete coordinated assembly of all devices and systems. Measure each ceiling area and lay-out ceiling system to balance border widths and perimeter spacing. Avoid using less than half-width or half-length panels. Coordinate with all devices furnished under other specification Sections to ensure devices are installed in the center of baffles, evenly spaces, and via overall orderly arrangement within the ceiling area.

3.03 INSTALLATION

A. Install acoustical units in locations indicated, following manufacturer's installation instructions and in accordance with local jurisdiction authorities.

B. Suspend ceiling hangers from overhead structure in accordance with manufacturer's instructions and applicable Codes.

C. Align panels accurately, with edges plumb and top edges level. Do not install damaged baffles.

D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
   1. Plumb and level.
   2. Flatness.
   3. Width of joints.

3.04 CLEANING

A. Clean baffle surfaces upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

B. Vacuum occasionally to remove any particulate matter and air-borne debris or dust. Compressed air can be used to dust the material in difficult to reach areas or for large assemblies.

3.05 PROTECTION

A. Provide protection of installed acoustical panels until completion of the work.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 9100
PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints and other coatings. High-performance coating at entrance canopy is to be performed under Section 09 9600 - High Performance Coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished (pre-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 gas piping only. See items scheduled NOT to be painted below.
      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 (pre-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. Exterior insulation and finish system (EIFS).
   13. Glass.
   14. Acoustical materials, unless specifically so indicated.
   15. Concealed pipes, ducts, and conduits.
   16. Door hinges, hardware, or fire door labels.
   17. Rusty or corroded surfaces until sandblasted or wire-brushed free of corrosion, and wiped clean.
   18. Mechanical and Electrical:
      a. In all areas, do NOT paint insulated and exposed pipes (except gas piping), conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

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 04 2000 - Unit Masonry Assemblies: Faces to be painted in this section.

C. Section 05 1200 - Structural Steel: Steel framing to be field painted.

D. Section 05 2100 - Steel Joist Framing: Steel joists to be field painted.

E. Section 05 3100 - Steel Decking: Prefinished steel decking to be protected from overspray during overhead painting operations.

F. Section 05 5000 - Metal Fabrications: Shop-primed items.

G. Section 07 0553 - Fire and Smoke Assembly Identification.

H. Section 08 1113 - Steel Doors and Frames: Shop-primed steel doors and frames.

I. Section 09 2116 - Gypsum Board Assemblies.

J. Section 09 9600 - High Performace Coatings: High performance coatings for exterior steel entrance canopy structure.

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. Location of Mock-Up shall be where directed. Mock-Up shall consist of complete application of coating system to full wall. Verify location with Architect before constructing.

G. 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.

H. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

I. 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 MAINTENANCE MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Supply one (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. Basis of Design: Sherwin-Williams: www.sherwin-williams.com.
   2. Other Acceptable Manufacturers:
      a. Benjamin Moore & Co: www.benjaminmoore.com.
      b. PPG Architectural Finishes, Inc: www.ppgaf.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

C. Block Fillers: Same manufacturer as top coats.

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. Paint WE-TR-St - Wood, Stained.
   1. Two Coats: S-W: Woodscapes Exterior Waterborne Semi-Transparent Polyurethane Stain, A15T5 (for vertical use).
   2. Two Coats: S-W: SuperDeck S/T Waterborne Stain, 2650 Series.

B. Paint CppE-OP-3A - Concrete, Poured and Precast:
   1. One Coat: S-W: Loxon Concrete & Masonry Primer, A24W8300, (<100 g/l voc).
   2. Two Coats: S-W: SuperPaint Acrylic Exterior House Paint (Flat, A80-100 series) (Satin, A89-100 Series) (Gloss, A84-100 Series) - Architect to select finish required (<50 g/l voc).

C. Paint CE-OP-3A - Masonry, Opaque, (One filler coat and two acrylic finish coats):
   1. One Coat: S-W: PrepRite Interior / Exterior Acrylic Block Filler, B25W25 (<50 g/l voc) (as required to be pinhole-free).

2. Two Coats: S-W: SuperPaint Exterior Acrylic House Paint, Gloss, A84-100 Series (<50 g/l voc).

D. Paint GEfibcem-OP-3A - Fiber Cement Board, Acrylic Primer and Paint, 3 Coat:
1. One Coat: S-W: Loxon Latex Primer, A24 (if unprimed).
2. Two Coats: S-W: A100 Exterior Acrylic House Paint, A82. More coats if needed to cover all fibering. Sheen: As selected from gloss or satin.

E. Paint GEsof-OP-3A - 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).

F. Paint ME-OP-3A - 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).

G. Paint ME-OP-2A - 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).

H. Paint MgE-OP-3A - 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. Paint WI-OP-3A - Wood, Opaque, Acrylic Latex, 3 Coat:
1. One Coat: S-W: Multi-Purpose Interior / Exterior Latex Primer /Sealer, B51-450 Series (<50 g/l voc).
2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel Enamel, B20-2600 (0 g/l voc).

B. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:
1. Filler coat: S-W: As required.
2. One coat of stain; S-W: WoodClassics “250” Interior Wood Stain, A49-800 Series (<250 g/l voc). Option: S-W: MinWax “250” VOC Stain (<250 g/l voc).
3. One coat sealer; S-W: none required.
4. Two coats; S-W: WoodClassics Waterbased Polyurethane, A68 Series (<350 g/l voc). Option: MinWax Waterbased Polyurethane Varnish: Satin (710337), Semi-Gloss (710320), Gloss (710313) (<350 g/l voc).

C. Paint CppI-OP-3A - Concrete, Poured and Precast, Opaque, Acrylic, 3 coats.
1. One Coat: S-W: Loxon Concrete & Masonry Primer, A24W8300 (<100 g/l voc).
2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).

D. Paint CI-OP-3L - Masonry, Opaque, Latex, 3 Coat:
1. One Coat: S-W: Pro Industrial Heavy Duty Block Filler, B42W150. (Required to be pin-hole free).
2. Two Coats: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).

E. Paint MI-OP-3A - 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).

F. Paint MI-OP-2A - 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.

G. Paint MgI-OP-3A - 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).

H. Paint CI-OP-3E - Concrete/Masonry [Inside Face of Single-Wythe Exterior Concrete Block Walls, and in Rest Rooms and other Wet Areas], Epoxy Enamel, 3 Coat:
1. One Coat: S-W: Kem Cati-Coat HS Epoxy Filler Sealer, B42W400. (Required to be pin-hole free) (Trowel to smooth finish may be required).

2. Two coats of waterborne epoxy polyamide (two-component, chemically-cured waterborne epoxy coating for use as a high performance architectural coating). S-W: Pro Industrial Water Based Catalyzed Epoxy (B73-300, Gloss) or (B73-360 EgShel). Architect to select finish required.

I. Paint GI-OP-3E - Gypsum Board, Epoxy, 3 Coat:
1. One coat of best commercial grade acrylic drywall primer, or as recommended by paint manufacturer. S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (0 g/l voc).
2. Semi-gloss: Two coats of S-W K46 Pro Industrial Precatalyzed Waterbased Epoxy. Scrub Resistance: 500-600 cycles per ASTM D 2486. MPI # 141, & 153, (145 g/L).

J. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
1. One Coat: S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (0 g/l voc).
2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20-2600 (0 g/l voc). (Where Sheen is indicated "Gloss", provide Pro Industrial™ High Performance Acrylic, B66-600 Series, <50 g/l voc).

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. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

M. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

N. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's instructions.

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. All surfaces shall be pinhole-free.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

H. Sand wood and metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 23 and 26 Sections for scheduling of color coding of equipment, duct work, piping, and conduit.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 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.

3.06 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.

3.07 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

3.08 SCHEDULE - SURFACES TO BE FINISHED

A. See drawings for surfaces to be painted.

END OF SECTION

SECTION 09 9600
HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.
   1. Coatings for Exterior Use: 3-coat high performance urethane system.
   2. Coatings for Exterior Galvanized Metal Use: 3-coat high performance system.

B. Surface preparation.

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. Division 5 - Structural & Miscellaneous Steel.

C. Section 09 9123 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

B. SSPC-SP1 - Solvent Cleaning; Society for Protective Coatings; Edition approved at time of bidding.

C. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

D. SSPC-SP 7 - Brush-Off Blast Cleaning; 2007.

E. SSPC-SP 11 - Power-Tool Cleaning to Bare Metal; 2020.

1.04 DEFINITIONS

A. Coatings: Paint or heavy duty finishes for use on surfaces subject to interior and exterior exposure, submergence, high moisture, splash, or chemical environment, including primers, sealers, fillers, and intermediate and finish coats.

B. Normal: Surfaces subject to normal temperature and humidity.

C. First Coat: Field primer, factory primer, or shop primer. When only one coat is required, first coat is the finish coat.

D. Second, Third, Intermediate, or Finish coats: Successive finish coats applied over first coat.

E. DFT: Dry Film Thickness (Mils/coat).

F. Sfpg: Square feet per gallon (per coat).

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating coating materials and _____.
   1. Manufacturer's literature including application recommendations and generic makeup for each coating scheduled.
   2. List each material and cross-reference the specific coating, finish system, and application.
   3. Submit one copy of manufacturer's Material Safety Data Sheets (MSDS) for each type of coating to Architect.
   4. Post copy of MSDS on the Site at all times when coating is in progress.

C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Applicator's approval by manufacturer.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include cleaning procedures and repair and patching techniques.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Coating Materials: 2 gallon of each type and color.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

I.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: All coatings shall conform to OSHA requirements for allowable exposure to lead and other hazardous substances.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section, approved in writing by coating manufacturer, and with minimum five years documented experience applying coating systems similar in material and extent to those indicated.

D. Single-Source Responsibility: Provide coating material produced by the same manufacturer for each system.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in original containers with labels intact and seals unbroken.

B. Protect and heat or cool material storage location to maintain temperature ranges recommended by coating manufacturers, but not less than 50 degrees F.

C. Oily rags and waste must be removed from buildings each night or kept in appropriate metal containers. Provide fire extinguishers of the type recommended by coating manufacturers in areas of storage and where finishing is occuring. Allow no smoking or open containers of solvent.

D. Empty containers shall have labels canceled and clearly marked as to use.

1.08 FIELD CONDITIONS

A. Environmental Requirements:
   1. Relative humidity conditions as specified by coating manufacturer shall be adhered to.
   2. Do not apply exterior coating when cold damp, foggy, or rainy weather appears probable, or when the temperature of the substrate is below 50 degrees F., unless approved in writing by the coating manufacturer.
   3. Maintain the manufacturer's environmental requirements until the coating is fully cured.
   4. Apply no coating in areas where dust is being generated.
   5. Restrict traffic from area where coating is being applied or is curing.

B. Protection:
   1. Drop cloths shall be provided in all areas where coating is performed to fully protect other surfaces.
   2. Remove hardware, accessories, plates, lighting fixtures, and similar items or provide protection by masking. Upon completion, replace items or remove protection and clean.

C. Upon substantial completion, remaining unused material will become property of the Owner. Seal material as required for storage, mark contents with color, type, location, and shelf life, and store on Site where required by Owner.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Manufacturer's Warranty: Manufacturer shall provide a 15-year color and gloss warranty that shall conform to the warranty offered by Basis-of-Design manufacturer.

D. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. High-Performance Coatings:
   1. Carboline Company: www.carboline.com.
   2. Tnemec Company, Inc [Basis of Design]: www.tnemec.com.
   3. Substitutions: Section 01 6000 - Product Requirements.
      a. Each request for substitution shall include the name of the specified material for which a substitute is being requested; name of the proposed substitute material; and a complete description of the proposed substitute including performance and test data, cure times, recoat windows, and generic composition. No request for substitution will be considered that would decrease film thickness or offer a change in the generic type of coating specified.
      b. Substitution requests shall be received by the Architect no later than 10 days prior to bid date.

2.02 SYSTEM DESCRIPTION

A. Coating System for Exterior:
   1. Exterior Exposed Ferrous Metals (Including Shop-primed Coat, Field-applied Intermediate Coat and Finish Coat):
      a. Surface Preparation: SSPC SP-6 Commercial Blast Cleaning.
      b. Primer/Shop Coat: Organic Zinc-Rich Urethane Primer.
         1) Dry Film Thickness: 2.5 - 3.5 mils.
         2) Solids by Volume: 63%.
         3) Zinc Content: 83% by Weight.
         4) Product: Tnemec Series 90-97 Tnemec-Zinc Exterior Primer.
      c. Intermediate Coat: Aliphatic Acrylic Polyurethane.
         1) Dry Film Thickness: 2.0 - 5.0 mils.
         2) Solids by Volume: 71%.
         3) Product: Tnemec Series 1075 Endura-Shield II - Exterior Intermediate Coat.
      d. Finish Coat: Fluoropolymer Polyurethane.
         1) Dry Film Thickness: 2.0 - 3.0 mils.
         2) Solids by Volume: 60%.
         3) Product: Tnemec Series 1070 Fluoronar Exterior Finish Coat.
      e. Total Dry Film Thickness: 6.5 - 11.5 mils.
         1) Scheduled thickness or coverage rate is the minimum recommended by Tnemec Company, Inc. If another manufacturer is used, manufacturer's recommendations shall be followed, but in no case shall the thickness or coverage rate be less than scheduled.

B. Coating System for Exterior Galvanized Metal:
   1. Exterior Exposed Galvanized Metals (Including Shop-primed Coat, Field-applied Intermediate Coat and Finish Coat):
      a. Surface Preparation: SSPC SP-7 Brush-off Blast.
      b. Primer/Shop Coat: Polyamidoamine.
         1) Dry Film Thickness: 3.0 - 5.0 mils.
         2) Solids by Volume: 67%.
         3) Product: Tnemec Series N69 Hi-Build Epoxoline II Primer.
      c. Intermediate Coat: Aliphatic Acrylic Polyurethane.
         1) Dry Film Thickness: 2.0 - 5.0 mils.
         2) Solids by Volume: 71%.
         3) Product: Tnemec Series 1075 Endura-Shield II - Exterior Intermediate Coat.
      d. Finish Coat: Fluoropolymer Polyurethane.
         1) Dry Film Thickness: 2.0 - 3.0 mils.
         2) Solids by Volume: 60%.
         3) Product: Tnemec Series 1070 Fluoronar Exterior Finish Coat.
      e. Total Dry Film Thickness: 7.0 - 13.0 mils.

1) Scheduled thickness or coverage rate is the minimum recommended by Tnemec Company, Inc. If another manufacturer is used, manufacturer's recommendations shall be followed, but in no case shall the thickness or coverage rate be less than scheduled.

2.03 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
   1. Colors: Selected from manufacturer's standard colors.

B. Fiberglass reinforced epoxy with water-based urethane topcoat wall system CMU - Concrete Masonry Units - from floor to 12 feet up of wall surface (match ceiling height under Mezzanine).
   1. Base Filler/Surfacer parge-fiber glass reinforced coat: Series 215 Surfacing Epoxy, two-component, 100% solids epoxy filler/surface with Series 237 Stranlok ML fiber glass mat reinforced.
   2. Body - Saturant Coat: Series 273 Stranlok ML resin, two-component, polyamine cured epoxy.
   3. Intermediate glaze coat: Series 280 Tneme-Glaze, two-component, polyamine cured epoxy.
   4. Finish coat: Series 297 Enviro-Tread UR, Two component, Water-based Urethane

C. Waterborne cementitious acrylic filler, 100% solids water-based epoxy, water-based urethane topcoat wall system CMU - Concrete Masonry Units - On wall surface from 12 feet up to ceiling.
   1. Base Filler/Surfacer: Series 130 Envirofill Waterborne Cementitious Acrylic filler/surface.
   2. Intermediate coat: Series 280 Tneme-Glaze, two-component, polyamine cured epoxy.
   3. Finish coat: Series 297 Enviro-Tread UR, Two component, Water-based Urethane

2.04 COLORS, MIXING, AND THINNING

A. Color shall be formed by pigments free of lead, lead compounds, or other materials that might be affected by the presence of hydrogen sulfide or other gases likely to be present at the Site.

B. Where thinning is necessary, only the products of the manufacturer furnishing the coating will be allowed. All such thinning shall be done in strict accordance with the coating manufacturer's recommendations.

C. Mix in accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 FIELD QUALITY CONTROL/JOB STANDARDS

A. Prior to commencing the installation, the contractor shall install, with the owner's approval, a mutually agreed upon test sample to show final color and texture of the system. This test area shall serve as a job standard for the final installation.

3.03 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Applicator must report, in writing, surfaces left in improper condition by other trades. Application will constitute acceptance of surfaces by applicator.

C. Prepare surfaces as required, per manufacturer's printed instructions.

D. Where surface dryness is questioned, test with a dampness-indicating instrument. Do not apply coatings over surfaces where moisture content exceeds that permitted by the coating manufacturer.

E. Remove finish hardware, fixture covers, and accessories and store.

F. Ferrous Metal:
   1. Ferrous metal unprimed or shop-primed with an incompatible primer shall be abrasive blast cleaned prior to the application of a primer. Blast cleaning shall conform to SSPC-SP6 for all ferrous surfaces to be coated with a high performance system.
   2. Ferrous metal previously primed or coated with the specified primer shall be cleaned in accordance to SSPC-SP11 for damaged areas and touch-up. Surface cleaning shall include solvent cleaning to remove soluble contaminants. Where the existing applied coating is of unknown origin, a test patch shall be applied to confirm compatibility with the scheduled coating.

G. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.04 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Ferrous structural steel shall be shop-primed. Field touch-up, where necessary, shall consist of surface preparation specified in Preparation paragraph.

3.05 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

C. Surfaces shall be dry at time of application.

D. The minimum surface temperature shall be 50 degrees F and rising unless noted otherwise.

E. Apply in strict accordance to the manufacturer's recommendations by brush, roller, spray or other application method. The number of coats and thickness required is the same regardless of application method.

F. Each coat shall be allowed to dry in accordance to the manufacturer's requirements. Drying time shall be construed to mean "under normal conditions". Where conditions other than normal exist, because of weather or because of confined space, longer times will be necessary.

G. Coatings shall be applied to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfectations will not be acceptable. Areas cut-in by brush prior to rolling shall have uniform appearance in comparison to adjoining surfaces.

H. Edges of coatings adjoining other materials or other colors shall be sharp and clean without overlapping.

I. Crevices and other hard to apply areas shall be back-rolled/back-brushed in conjunction with the prime coat.

J. Where multiple coats of the same material are applied, each undercoat shall be slightly different in shade to facilitate identifying each coat.

3.06 FINAL TOUCH-UP

A. Prior to substantial completion, examine the coated surfaces and retouch or refinish surfaces to leave in condition acceptable to the Architect.

3.07 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. Remove masking, coatings, and other material from floors, glass, and other surfaces not scheduled to be coated.

D. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

E. Leave work areas in clean condition.

3.08 PROTECTION

A. Protect the completed work from water, airborne particles or other surface contaminants for a minimum of 24 hours after application.

B. Protect from traffic, physical abuse, immersion and chemical exposure for 24 hours at 75 degrees F. For different temperatures, consult the manufacturer's representative for curing times.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Storm Shelter signs required by the ICC.

E. Building identification signs.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

B. Section 09 9600 - High Performance Coatings: Finishing of exterior building identification sign.

C. Division 22 - Mechanical Identification.

D. Division 26 - Electrical Identification.

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.

D. NFPA 170 - Standard for Fire Safety and Emergency Symbols; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's Qualification Statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

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. Provide manufacturer's standard warranty against defects in materials and workmanship for minimum 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat (Interior) Signs:
   1. Basis of Design: APCO "Elevate" Signs; www.apcosigns.com.
   2. Other Acceptable Manufacturers:
      a. TakeForm, Inc.; www.takeform.net.
      b. Best Sign Systems, Inc: www.bestsigns.com/#sle.
      c. Inpro: www.inprocorp.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Exterior Building Identification Signs:
   1. Andco Industries Corporation.
   2. Cosco Industries: www.coscoarchitecturalsigns.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Leeds Architectural Letters, Inc..
   5. Substitutions: See Section 01 6000 - Product Requirements.

C. Plaques:
   1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
   2. FASTSIGNS; _____: www.fastsigns.com/#sle.
   3. Substitutions: See Section 01 6000 - 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. Room, Directional, Informational, and Door Signs: Provide interior signage as indicated on the drawings.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch unless indicated otherwise.

C. Emergency Evacuation Maps:
   1. Map content to be provided by Owner.
   2. Allow for six (6) Emergency Evacuation Maps, unless otherwise indicated on the drawings.
   3. Mounting: Flush mounted.
   4. Size: 16 inches square, unless otherwise indicated on the drawings.

D. Storm Shelter Signage Required by ICC-500:
   1. Entrance Signage: Provide signage indicating "Tornado Shelter" at each entrance to storm shelter. See drawings for size and required content. Signage shall be tactile as well as visual in compliance with ICC A117.1 and 2010 ADA Standards.
   2. Access Signage: Provide signage depicting general location of storm shelter areas and accessways adjacent to the shelter access door on the inside of the shelter, in the designated storm shelter facility managers office, and at the Office of the facility manager.
   3. See drawings for ICC required Storm Shelter Signage requirements.

E. Building Identification Signs:
   1. Provide building identification sign as indicated on the drawings. Use metal components to match the exterior signage illustrated on the drawings.
   2. Shop prime and field finish the sign as indicated, in color to be selected by Archtect.
   3. Mount on exterior as indicated on drawings.

2.03 SIGN TYPES

A. Flat Signs: As indicated on the drawings.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.
   4. Wall "Flag" Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: As indicated on drawings.
   2. Character Case: Upper and lower case (title case).
   3. Background Color: As scheduled.
   4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

2.05 PLAQUES

A. Metal Plaques:
   1. Metal: Aluminum casting.
   2. Metal Thickness: 1/8 inch, minimum.
   3. Size: 24 inches by 36 inches.
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper case only.
      c. Character Color: Contrast with background color.
   5. Border Style: As indicated on drawings.
   6. Background Texture: Ripple.
   7. Surface Finish: Brushed, satin.
   8. Painted Background Color: Light oxide stain.
   9. Protective Coating: Manufacturer's standard clear coating.

2.06 EXTERIOR BUILDING IDENTIFICATION SIGNS

A. Metal Letters and Forms:
   1. Metal: Steel or Aluminum plate.
   2. Metal Thickness: 3/8 inch minimum.
   3. Text and Typeface:
      a. Character Font: To be selected.
      b. Character Case: To be selected.
   4. Finish: Finish shall be per Section 09 9600 - High Performance Coatings.
   5. Mounting: As indicated on drawings.

2.07 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

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 and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2113.19
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 and Dovision 01 Specification Sections apply to this Section.

B. Section 05 1200 - Structural Steel Framing: Concealed steel support members.

C. Section 05 5000 - Metal Fabrications: Concealed steel support members.

D. Section 06 1000 - Rough Carpentry: Blocking and supports.

E. Section 10 2800 - 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; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

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 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in strict accordance with the manufactuers printed instructions.

1.07 WARRANTY

A. Provide manufacturer's standard written warranty on panels, pilasters, and doors against breakage, corrosion, and delamination; to be replaced without charge, including labor.

B. Warranty Term: Twenty-five (25) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. Basis of Design: Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.
   2. Other Acceptable Manufacturers:
      a. Partition Systems International of South Carolina: www.psisc.com.
      b. Global Partitions: www.globalpartitions.com.
   3. Substitutions: Section 01 6000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
   1. Color: Single color as selected.
   2. Doors:
      a. Thickness: 1 inch.
      b. Width: 24 inch.
      c. Width for Handicapped Use: 36 inch, out-swinging.
      d. Height: 58 inch.
   3. Panels:
      a. Thickness: 1 inch.
      b. Height: 58 inch.
      c. Depth: As indicated on drawings.
   4. Pilasters:
      a. Thickness: 1 inch.
      b. Width: As required to fit space; minimum 3 inch.
   5. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Extruded aluminum, anti-grip profile.
   1. Size: Manufacturer's standard size.

C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hinges: Stainless steel, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

F. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

G. Coat Hook: One per compartment, mounted on door.

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 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

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SECTION 10 2800
TOILET ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.
   1. Public-use washroom accessories
   2. Public-use shower room accessories
   3. Private-use bathroom accessories
   4. Healthcare accessories
   5. Warm-air dryers
   6. Childcare accessories
   7. Underlavatory guards
   8. Custodial accessories

B. Related Requirements:
   1. Section 088300 "Mirrors" for frameless mirrors.

1.03 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.
   1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

1.05 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from a single source from a single manufacturer.

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 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials: ____.

2.02 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.

2.03 MANUFACTURER

A. Basis-of-Design Products: Subject to compliance with requirements, provide the listed Basis-of-Design Products.
   1. Bobrick Washroom Equipment, Inc. (Basis-of-Design Product Manufacturer)

2.04 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.

2.05 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue Dispenser (Jumbo Roll): **TA02 - BY OWNER**

B. Waste Receptacle, Surface Mount, Small: TA12
   1. Basis-of-Design Product: Bobrick B-279
   2. Description: Removable vinyl liner attaches to four interior hooks in waste receptacle.
   3. Mounting: Surface Mounted.
   4. Minimum Capacity: 6 gallon.
   5. Material and Finish: Stainless steel, No. 4 satin finish.
   6. Waste Receptacle Profile: Rectangular with lightly radiused corners.
   7. Liner: Reusable vinyl liner with grommets.

C. Soap Dispenser, Liquid Type, Manual: TA15 - BY OWNER

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: TA31
1. Basis-of-Design Product: Bobrick B-165-2436
2. Frame: Stainless steel channel.
3. Corners: Mitered, welded, and ground smooth.
4. Hangers: Produce rigid, tamper and theft-resistant installation, using one-piece, galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
5. Size: 24 inches wide x 36 inches high.

H. Mirror, Framed, without Shelf (Full-Length): TA32
1. Basis-of-Design Product: Bobrick B-165-2460
2. Frame: Stainless steel channel.
3. Corners: Mitered, welded, and ground smooth.
4. Hangers: Produce rigid, tamper and theft-resistant installation, using one-piece, galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
5. Size: 24 inches wide x 60 inches high.

I. Robe Hook: TA33
1. Basis-of-Design Product: Bobrick B-6717
2. Mounting: Surface mounted.
3. Material and Finish: Stainless steel, No. 4 satin finish.

J. Grab Bar: TA26
1. Basis-of-Design Product: Bobrick B-6806 x 30
2. Mounting: Flanges with concealed fasteners
3. Material: Stainless Steel, 0.05 inch thick.
4. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area
5. Outside Diameter: 1 - 1/2 inches
6. Configuration and Length: Straight, 30 inches long.

K. Grab Bar: TA27
1. Basis-of-Design Product: Bobrick B-6806 x 48
2. Mounting: Flanges with concealed fasteners
3. Material: Stainless Steel, 0.05 inch thick.
4. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area
5. Outside Diameter: 1 1/2 inches
6. Configuration and Length: Straight, 48 inches long.

L. 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.

2.06 PUBLIC USE SHOWER ROOM ACCESSORIES

A. Shower Curtain Rod, Extra-Heavy-Duty (straight): TA41
   1. Basis-of-Design Product: Bobrick B-6047
   2. Description: 1-1/4 inch OD; fabricated from nominal 0.0375-inch-thick stainless steel.
   3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
   4. Finish: Stainless steel, No. 4 satin finish.

B. Shower Curtain: TA42
   1. Basis-of-Design Product: Bobrick B-XX
   2. Description:
   3. Size: Minimum 6 inches wider than opening by 72 inches high.
   4. Material: Duck, minimum 8 oz., white, 100 percent cotton.
   5. Color: White.
   6. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
   7. Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

2.07 WARM AIR DRYERS

A. Warm Air Dryer: TA80
   1. Basis-of-Design Product: Bobrick B-7128-115V
   2. Mounting: Surface mounted.
   3. Operation: Electronic sensor activated with timed power cut-off switch.
      a. Operation time: 30 to 40 seconds.
      b. Cover Material and Finish: Stainless steel, No. 4 satin finish.
      c. Electrical Requirements: 115V, 15A, 1725W.

2.08 CHILDCARE ACCESSORIES

A. Diaper-Changing Station: TA55
   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.

2.09 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.

2.10 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.

2.11 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.12 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.

END OF SECTION 102800

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SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Secure Key Safe.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections apply to this Section.

B. Section 04 2000 - Unit Masonry.

C. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

D. Section 09 2116 - Gypsum Board Assemblies: Roughed-in wall openings.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguisher Cabinets and Accessories:
   1. Amerex Corp.: www.amerex-fire.com
   2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   3. Nystrom: www.nystrom.com.
   4. Potter-Roemer: www.potterroemer.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Stored Pressure Operated: Deep Drawn.
   2. Class: A:B:C type.
   3. Size and classification: UL-rated 4-A: 60-B: C, 10 pound nominal capacity.
   4. Finish: Baked polyester powder coat red color.

5. Extent: For all locations indicated, except kitchen or food prep areas.
6. Temperature range: Minus 40 degrees F to 120 degrees F.

C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
1. Class: K.
2. Size and classification: UL-rated 10K, 5-pound nominal capacity.
3. Finish: Polished stainless steel.
4. Temperature range: -20 degrees F to 120 degrees F.
5. Extent: For kitchen and food prep areas.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Configuration: Semi-recessed type, unless shown otherwise.
1. Sized to accommodate accessories and extinguisher.
2. Trim: rolled edge, 2.5 inch wide (unless indicated otherwise) face.

B. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinges. Provide nylon catch. Door style equal to Larsens "Vertical Duo".

C. Door Glazing: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing.

D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

E. Fabrication: Weld, fill, and grind components smooth.

F. Finish of Cabinet Exterior Trim and Door: Stainless Steel, Type 304, brushed finish.

G. Finish of Cabinet Interior: Stainless Steel, Type 304, brushed finish.

2.04 SECURE KEY SAFE

A. Product: Recessed, Heavy Duty, 10 Key, Knox Box Series 3200. Quantity: 1 per building. www.knoxbox.com.

2.05 ACCESSORIES

A. Extinguisher Brackets (if required): Formed steel, galvanized and enamel finished.

B. Cabinet Signage: Red letters: "Fire Extinguisher".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings; see drawings for mounting height, or, if not indicated, at height to comply with applicable regulations of governing authorities.

C. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

D. Secure rigidly in place.

E. Install one fire extinguisher in each fire extinguisher cabinet and bracket.

F. Recessed installation of Secure Key Safe Boxes: location to be coordinated with local Fire Marshall. Install according to manufacturer's recommendations.

END OF SECTION

SECTION 10 5100
LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

B. Phenolic lockers.

C. Locker units with hinged doors.

D. Metal bases, tops, and filler panels.

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.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, including locker types, sizes and quantities. Include all necessary details related to anchoring, installation, fillers, trim, base, accessories, and dimensioned relation to adjacent surfaces.

1. Numbering: The locker numbering sequence shall be provided by the approving authority and noted on approved drawings returned to the locker contractor.

D. Color Samples: Submit samples of all manufacturer's available paint colors on specified base metal (chain set) for Architect's color selection.

E. Verification Samples: If requested, submit two samples 3 x 6 inches in size, of each color selected; applied to specified base metal.

F. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 QUALITY ASSURANCE

A. Manufacturer shall be a firm with not less than 5 years of successful experience in manufacturing products specified in this Section.

B. Lockers shall be GreenGuard Gold Certified by UL Environment through the GreenGuard Certification Program.

C. Installer shall be a firm with not less than 5 years of successful experience in installation of products specified in this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until building is enclosed and ready for locker installation.

B. Protect locker finish and adjacent surfaces from damage.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Faulty operation of latches and other door hardware.
2. Damage from deliberate destruction and vandalism is excluded.

B. Provide manufacturer's standard warranty against defects in material and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
   1. Art Metal Products: www.artmetalproducts.com.
   2. List Industries Inc.: www.listindustries.com. [basis of design]
   3. Penco Products, Inc: www.pencoproducts.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. The approval of manufacturers does not relieve the contractor from furnishing products which comply with all detailed requirements of specification.

C. Manufacturers' products shall be standard cataloged items and shall be a consistently offered line of equipment. Manufacturers published literature must clearly show that the products being furnished are in compliance with these specifications. Otherwise a detailed listing of differences is required prior to bid.

2.02 METAL LOCKERS

A. Unibody All-Welded Lockers:
   1. General:
      a. Doors: 14 gauge louvered sheet steel with recessed handle, and multi-point gravity lift-type latching
      b. Sides: 16 gauge solid sheet steel
      c. Tops, Bottoms, Shelves: 16 gauge solid sheet steel
      d. Backs: 18 gauge solid sheet steel
   2. Materials:
      a. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of high gloss baked enamel.
      b. Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slotless type; self locking nuts or lock washers.
      c. Hardware: Hooks and hang rods of cadmium plated or zinc plated steel or cast aluminum.
      d. Handle: Seamless drawn stainless steel recessed handle
      e. Number Plates: To be aluminum with not less that 3/8" high etched numbers attached to door with two aluminum rivets.
   3. Construction:
      a. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.
         1) UNIBODY/VERTICAL SIDE PANELS: Shall be of integral frame and side wall construction manufactured from solid 16 gauge sheet steel. The one-piece side/frame shall be formed to provide a continuous door strike on the hinge side. An additional continuous vertical door strike shall be achieved at the latch side by MIG welding a 16 gauge full height channel frame member to the integral locker side producing a rigid torque-free welded locker body. The frame shall include a tab which engages a slot in the base locking the side panel and frame into position. Sides to be solid.
         2) INTEGRAL FRAME LOCKER BASE: 16 gauge formed sheet steel with double return flanges at the front and rear. A full depth horizontal channel shall be MIG welded under the locker bottom front-to-back at the left and right side of each welded locker unit as well as beneath each vertical side panel for maximum rigidity.
         3) FLAT TOPS: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple locker unit.
         4) HAT SHELVES, INTERMEDIATE SHELVES AND BASES: Shall be 16 gauge sheet steel, have double bends at front and shall be MIG welded to the sides.
         5) BACKS: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple unibody unit and be welded to each vertical side panel.

6) WARDROBE DOORS: Doors 20” high and over and 15” wide and under shall be fabricated from single sheet prime 14 gauge with single bends at top and bottom and double bends at the sides. The channel formed by the double bend at the latch side is designed to fully conceal the lock bar. Doors to be louvered.
7) HANDLE: All locker doors shall have a seamless drawn 304 stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recess pan shall be deep enough to have the lock be completely flush with the outer door face. A finger lift/padlock hasp shall protrude through the top of the handle for easy opening of the locker door.
8) LATCHING: The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position. Locking device shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 12 gauge (minimum) and shall be MIG welded to vertical frame member. Provide three latch hooks for doors 48" and over and two for doors under 48".
9) DOOR HINGES: Hinges for wardrobe doors shall not be less than 16 gauge continuous piano type, securely riveted to frame and welded to the door. All doors shall be right hand side hinged.

B. Knock Down (KD) Lockers:
1. General:
a. Wardrobe Doors: 16 gauge louvered sheet steel with recessed handle, and multi-point gravity lift-type latching (18 gauge at 9” wide)
b. Box Doors: 18 gauge louvered sheet steel with recessed handle, and single-point, through-the-door, friction catch finger pull latching
c. Sides: 24 gauge solid sheet steel.
d. Tops, Bottoms, Shelves: 24 gauge solid sheet steel
e. Backs: 24 gauge solid sheet steel
2. Materials:
a. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of custom blend powder coat.
b. Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slotless type; self locking nuts or lock washers.
c. Hardware: Hooks and hang rods of cadmium plated or zinc plated steel or cast aluminum.
d. Handle: Seamless drawn 304 stainless steel recessed handle.
e. Number Plates: To be aluminum with not less that 3/8" high etched numbers attached to door with two aluminum rivets.
3. Construction:
a. Fabricate lockers square, rigid and without warp, with metal faces flat and free from dents or distortion. Make all exposed metal edges safe to touch. Weld frame members together to form a rigid, one-piece structure. Weld, bolt or rivet other joints and connections as is standard with manufacturer. Grind exposed welds flush. Do not expose bolts or rivet heads on front of locker doors or frames except for fastening of number plates and recessed handle.
1) FRAME: Fabricate of 16 gauge (minimum) channels, with integral continuous door stop/strike formed on both latch and hinge side vertical members. Cross frame members of 16 gauge channel shapes, including intermediate cross frame members on double and triple tier (frames with doors over 18" high) lockers shall be securely welded to the vertical framing members to ensure rigidity. Rubber bumpers shall be provided for wardrobe doors to cushion door closing.
2) HAT SHELVES, INTERMEDIATE SHELVES AND BOTTOMS: Shall be formed with 24 gauge (minimum) solid sheet steel with single return bends at all sides. Bolt top and bottom as well as horizontal tier dividers of wardrobe openings to front horizontal frame members at not less than one place in addition to side panels. Form hat shelves at 60” and 72” high single tier lockers of 16 gauge (minimum) sheet steel with single bends at sides and back and a double bend at front.

3) BACKS: Shall be 24 gauge (minimum) cold rolled sheet steel with double flanged connections extending full height.
4) WARDROBE DOORS: Doors 20” high and higher shall be fabricated from single sheet prime 16 gauge (18 gauge for 9” wide) with single bends at top and bottom and double bends at the sides. The channel formed by the double bend at the latch side is designed to fully conceal the lock bar. Doors to be louvered.
5) LATCHING: The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position. Locking device shall be designed for use with either built-in combination locks or padlocks. Provide three latch hooks for doors 48" and over and two for doors under 48".
6) HANDLE: All wardrobe locker doors shall have a seamless drawn 304 stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recess pan shall be deep enough to have the lock be completely flush with the outer door face. A finger lift/padlock hasp shall protrude through the top of the handle for easy opening of the locker door.
7) BOX DOORS: Doors 18” high and under shall be fabricated from single sheet prime 18 gauge with single bends at top, bottom and sides. Doors shall include a combination friction catch door pull. Padlock strike plates are optional. Doors shall be fabricated to accept a built-in combination lock or padlock. Doors with projecting spring latches shall not be acceptable. Doors shall be louvered.
8) DOOR HINGES: All doors shall include a 16 gauge continuous piano hinge welded to the door and riveted to the frame. All doors to be right hand, side hinged.

2.03 PHENOLIC LOCKERS

A. Wardrobe Locker:
1. Doors: 1/2” thick solid phenolic with through the door padlock lug and protruding door pull.
2. Tops, Bottoms, Shelves: 3/8” thick solid phenolic.
3. Sides: 5/16” thick solid phenolic.
4. Backs: 1/4” thick solid phenolic.

B. Materials:
1. Phenolic: Material shall be Solid Phenolic with a high pressure melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable. Surface and edges shall be non-porous and shall not support fungus or bacteria. Provide material which has been selected for uniform color, surface flatness and smoothness. VersaMax Phenolic lockers shall meet or exceed all requirements for Class B Flame Spread Rating (not to exceed 75) and Smoke Developed (not to exceed 450) and shall carry a Class B Fire Rating Certification. Fabricate lockers square, rigid and without warp. Locker units will ship factory pre-assembled.
2. Fasteners: All fastening hardware shall be stainless steel with theft proof head
3. Hardware: Hooks shall be fabricated of 11 gauge type 304 stainless steel attached to locker body with theft proof stainless steel hardware
4. Handle/Latch: Hasp shall be fabricated of 11 gauge type 304 stainless steel with a satin finish. All edges shall be polished and smooth. Hasp shall be attached to the locker body with two (2) stainless steel theft proof torx head with pin, through bolts. Hasp shall extend through a slot in the face of the locker door. Handle shall be finger pull type. Doors are prepared for use with a padlock.
5. Number Plates: To be aluminum with not less that 3/8" high etched numbers attached to door with theft proof fasteners.

C. Constrction:
1. Surface and edges shall be nonporous. Provide material which has been selected for uniform color, surface flatness and even texture. Exposed surfaces which exhibit discolorations, pitting, seam marks, roller marks, stains, telegraphing, or other imperfections on finished units are not acceptable.
a. DOORS: Shall be fabricated of 1/2” thick solid phenolic. Doors shall be the full width of the locker and shall be frameless, allowing access to the entire width of the locker. Framed doors are unacceptable. Plain doors with perimeter ventilation shall provide ventilation properties superior to

that of traditional framed doors. Door and accessory color to be selected from manufacturer's standard list of colors.

b. BODY: Tops, bottoms, and shelves shall be made from 3/8" thick solid phenolic. Sides and backs shall be made from 5/16" thick solid phenolic. Body components shall be white in color. Body incorporates mortise and tenon construction and shall be mechanically fastened together with stainless steel fasteners. Multiple width units will share intermediate sides and have unit width top, bottom, back and shelf/tier divider.

c. HINGES: Hinges shall be 14 Gauge Type 304 Stainless Steel and shall have a black powder coat finish. Hinge shall have five (5) knuckles and shall be "Hospital" type with beveled top and bottom knuckles. Knuckles of Hinge shall be exposed to allow Door to open 180°.

d. HANDLES/LATCHING: Hasp shall be fabricated of 11 gauge type 304 stainless steel with a satin finish. All edges shall be polished and smooth. Hasp shall be attached to the locker body with two (2) stainless steel theft proof torx head with pin, through bolts. Hasp shall extend through a slot in the face of the locker door. Handle shall be finger pull type. Doors are prepared for use with a padlock.

2.04 FABRICATION

A. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, safe to touch.

2.05 FINISHING

A. Clean, degrease, and neutralize metal; prime, and finish with two coats of baked enamel.
   1. Color: As selected by Architect from manufacturer's full collection of colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and referenced standards.

B. Install lockers plumb and square.
   1. Units shall be set in place, plumb, level, rigid, flush and securely attached to the wall and anchored to the floor or base according to manufacturer's specifications.

C. Place and secure on specified base.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
   1. Anchor about 48" o.c., unless otherwise recommended by manufacturer. Also where necessary to avoid metal distortion, using concealed fasteners. Friction cups are not acceptable.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels.
   1. Attach using concealed fasteners. Provide flush, hairline joints against adjacent surfaces.

G. Install accessories.

H. Replace components that do not operate smoothly.

3.03 ADJUSTMENT

A. Upon completion of installation, inspect lockers and adjust as necessary for proper door operation. Touch-up scratches and abrasions to match original finish.

3.04 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

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SECTION 11 3013
KITCHEN AND LAUNDRY EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Kitchen appliances, Owner Furnished, Contractor Installed.

C. Laundry appliances.

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. Division 15 Section for Plumbing Piping: Plumbing connections for appliances.

C. Division 16 Section for Equipment Wiring: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

C. Gas Appliances: Bearing design certification seal of AGA.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

PART 2 - PRODUCTS

2.01 KITCHEN APPLIANCES

A. All Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Ice Machine (S8): Undercounter, ADA, Ice Maker:
   1. Stainless Steel exterior.
   2. Built in 5016
   3. Size: 14.5"W x 25"D x 32.38"H.
   4. Location: See drawings.
   5. Manufacturer/Product: Summit BIM44GADA
   6. Other Manufacturers:
      a. Ice-O-Matic: www.iceomatic.com.
      b. Manitowoc: www.manitowocice.com.
      c. Substitutions: See Section 01600 - Product Requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment.

B. Wash and clean equipment.

END OF SECTION

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SECTION 11 5213
PROJECTION SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Front projection screen assemblies.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract including Supplementary Conditions and Division 01 Specification Sections apply to the Section.

B. Section 06 1000 - Rough Carpentry: Wood blocking in walls and ceilings.

C. Section 09 2116 - Gypsum Board Assemblies: Suspended gypsum board ceilings for recessed screens, and openings in gypsum board partitions for fixed and rear projection screens.

D. Section 09 5100 - Acoustical Ceilings: Suspended panel ceilings for recessed screens.

E. Section 09 9000 - Painting.

F. Division 26 - Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Wiring diagrams for motor operators and actuators, and controls and switches.

C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Samples: For screen fabrics, submit two samples 6 by 6 inch in size.

E. Samples: For case and frame finishes, submit two samples 6 by 6 inch in size, illustrating color and texture of finish.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F and 75 degrees F during and after installation of projection screens.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

A. Basis of Design:
   1. Draper, Inc (Motorized); Access Series "Premier XL": www.draperinc.com/#sle.

B. Other Acceptable Manufacturers:
   1. Da-Lite Screen Company: www.da-lite.com/#sle.
   2. Stewart Filmscreen Corporation: www.stewartfilmscreen.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.
   1. Products by listed manufacturers are subject to compliance with specified requirements.

D. Front Projection Screens: Factory assembled unless otherwise indicated.
   1. Type S-10: Multipurpose: Motorized, matte light diffusing fabric screen, horizontally tensioned, wall mounted.
      a. Screen Dimensions: 120 inch high by 144 inch wide.

E. Masking Borders: Black, on four sides.

F. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Handle rigid screen materials with care to avoid damage. Use equipment only on uncoated side.

E. Install plumb and level.

F. When installing electrical masking, do not damage underlying screen.

G. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

H. Test masking systems for proper format control. Adjust as needed.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Protect rigid rear projection screens with temporary covering over optical coating side of screen.
   1. Do not adhere tape to screen surface.

C. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 11 5225
FLAT PANEL MOUNTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Mounts for flat A-V panels.
   2. Ceiling Mount Kit for Projector.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. Section 06 1000 - Rough Carpentry: Wood backing.

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 09 5100 - Acoustical Ceilings.

E. Section 11 5213 - Projection Screens.

F. Division 26 - 28 - Electrical: Sections for electrical wiring, connections, and installation of projectors.

1.03 SUBMITTALS

A. Product Data: For each type of mount specified. Include storage and handling requirements and Installation instructions.

B. Shop Drawings: Show layout and assembly of brackets, and accessories. Show mounting and details.

1.04 QUALITY ASSURANCE

A. Coordination of Work: Coordinate layout and installation of panel mounts with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver mounts and brackets until building is enclosed, and other construction within spaces where mounts will be installed is substantially complete.

B. Store products in manufacturer’s unopened packaging until ready for installation.

1.06 COORDINATION

A. Coordinate work with installation of ceilings, walls, electrical service power characteristics, and location.

PART 2 - PRODUCTS

2.01 FIXED UNIVERSAL ULTRA SLIM FLAT WALL MOUNT

A. For 23" to 46" Flat Panel Displays. Slim profile required: 0.19" unless otherwise approved by Architect.

B. Manufacturers:
   1. Basis of Design: Peerless "SUF641".
   2. Other Acceptable Manufacturers:
      a. Da-Lite.
      b. Hafele.
   3. Substitutions: Section 01600 – Product Requirements.

C. Provide with all required attachment hardware.

D. Quantity: See Equipment Plans.

2.02 ARTICULATING UNIVERSAL ULTRA SLIM WALL ARM

A. For 32" to 46" Ultra-thin Flat Panel Displays.

B. Manufacturers:
   1. Basis of Design: Peerless "SUA737".

2. Other Acceptable Manufacturers:
   a. Da-Lite.
   b. Hafele.
3. Substitutions: Section 01600 – Product Requirements.

C. Provide with all required attachment hardware.

D. Quantity: See Equipment Plans.

2.03 CEILING MOUNT KIT FOR PROJECTOR

A. Universal Ceiling Tile Kit for projector to fit 2x2 ft. tile grid; including 2' x 2' plate designed to sit above suspended ceiling unseen and secured by safety wire; with nine mounting hole positions with threaded ends for accepting 1-1/2" NPT extension column. Provide with wire panel support, electrical box, cross tee support, screw lags and grommet, projector cable lock, and fixed extension column 6" length 1.5" diameter.

B. Manufacturer/Model No.:
   1. Dukane 110-4089U-LC Universal Ceiling Tile Kit.
   2. Requests for substitutions will be considered in accordance with provisions of Section 01600 - Product Requirements.

C. Extent: One for each projection screen illustrated on the Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify rough-in openings are properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install mounting brackets and accessories at locations indicated in compliance with manufacturer's instructions.

3.04 PROTECTING AND CLEANING

A. Protect brackets and mounts after installation from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION

SECTION 11 6623
GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY:

A. This Section includes the following gymnasium equipment:
   1. Basketball equipment, electrically and manually operated.
   2. Volleyball equipment, manually operated.
   3. Wall-mounted and post column safety pads.
   4. Judge's stand.
   5. Scoring table.
   6. Shot Clock.

B. Related Sections include the following:
   1. Division 3 Section "Concrete" for installation of floor insert sleeves, for oversized recessed voids to be cast in concrete floors, and for thickened slabs at these locations.
   2. Division 5 Sections “Metal Fabrications” and "Structural Steel" for structural supports not provided by gymnasium equipment manufacturer for supporting gymnasium equipment to building structure.
   3. Section 11 6653 - Gymnasium Divider Curtain.
   4. Section 11480 - Scoreboards.
   5. Division 26 - Electrical.
      a. Manufacturer of electrical items in this Section shall coordinate junction box with switch plate in field.

C. Products furnished, but not installed under this Section, include floor insert sleeves for inserts to be cast in concrete subfloors and footings.

1.03 DEFINITIONS:

A. FIBA: International Basketball Federation (Federation Internationale de Basketball Amateur).

B. FIVB: International Volleyball Federation (Federation Internationale de Volleyball).

C. NAGWS: National Association for Girls and Women in Sport.

D. NCAA: National Collegiate Athletic Association.

E. NFHS: National Federation of State High School Associations.

F. USAV: United States of America Volleyball (formerly, USVBA: U.S. Volleyball Association).

1.04 PERFORMANCE REQUIREMENTS:

A. Seismic Performance: Provide basketball backstops capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads," whichever is more stringent.

1.05 SUBMITTALS:

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.

B. Shop Drawings: Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
   1. Blocking and Reinforcement: Show locations of blocking and reinforcement required for support of gymnasium equipment.

2. Setting Drawings: For cast-in floor insert sleeves for post standards.
3. Design Calculations: Upon request, submit signed and sealed design calculations by a qualified professional engineer. Calculate requirements for supporting gymnasium equipment and for seismic restraint. Verify capacity of members and connections to support loads and verify loads, point reactions, and locations for attachment of gymnasium equipment to structure with those indicated on Drawings.

C. Coordination Drawings: Court layout plans and elevations drawn to scale and coordinating oversized recesses for deferred installation of floor insert sleeves, and/or floor-insert penetrations, and game lines and markers applied to finished flooring.

D. Samples for Initial Selection: For each type of gymnasium equipment indicated.

E. Samples for Verification: For the following products:
1. Pad Fabric: Not less than 3 inches (80 mm) square, with specified treatments applied. Mark face of material.
2. Volleyball Floor Insert: Full size unit, which after review and acceptance, upon request, may be picked up by the Contractor for use in the project.

F. Product Certificates: For each type of gymnasium equipment, signed by product manufacturer.

G. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.

H. Qualification Data: For installer and for professional engineer.

I. Maintenance Data: For gymnasium equipment and gymnasium equipment operator to include in maintenance manuals.

1.06 QUALITY ASSURANCE:

A. Installer Qualifications: A qualified installer employing workers trained and approved by manufacturer.
1. Refer to Section 01 0150 - “Special Conditions”, for additional information regarding minimum experience requirements.

B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.

C. Standards: Provide gymnasium equipment complying with or exceeding requirements of the Alabama High School Athletic Association, and the above referenced standards.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.07 PROJECT CONDITIONS:

A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment. Verify dimensions by field measurements.

1.08 COORDINATION:

A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.

B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.09 WARRANTY:

A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Basketball backboard failures including glass breakage.
b. Faulty operation of basketball backstops.

c. Volleyball post standards and net tensioning system.

2. Warranty Period:
   a. Basketball equipment: 25 years from date of substantial completion.
   b. Volleyball equipment: 10 years from date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Basketball Equipment:
   a. AALCO.
   b. AL, Inc.; ADP Lemco, Inc.
   c. Arizona Courtlines.
   d. Basketball Products International; American Athletic, Inc.
   e. Bison Inc.
   f. Draper.
   g. Garner.
   h. Institutional Products, Inc.
   i. Jaypro Sports, Inc.
   j. Performance Sports Systems, Inc.
   k. Porter Athletic Equipment Co.
   l. Spalding.
2. Volleyball Equipment:
   a. AALCO.
   b. American Athletic, Inc.
   c. Arizona Courtlines
   d. Bison Inc.
   e. Draper.
   f. Garner.
   g. Jaypro Sports, Inc.
   h. Performance Sports Systems, Inc.
   i. Porter Athletic Equipment Co.
   j. Schelde North America.
   k. Spalding.
   l. Sports Imports, Inc.
3. Wall-Mounted and Post Column Safety Pads:
   a. AALCO.
   b. AL, Inc.; ADP Lemco, Inc.
   c. Alabama Contract Sales
   d. American Athletic, Inc.
   e. Arizona Courtlines
   f. Draper
   g. Garner
   h. Institutional Products, Inc.
   i. Jaypro Sports, Inc.
   j. Performance Sports Systems, Inc.
   k. Porter Athletic Equipment Co.
   l. Spalding

2.02 MATERIALS, GENERAL:

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; mill finish or decorative, baked-enamel, powder-coat finish.

1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
2. Cast Aluminum: ASTM B 179.

B. Steel: Comply with the following:
   1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, hot-dip galvanized.
   2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53.
   3. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless another grade is required by structural loads.
   4. Steel Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513 or steel tubing fabricated from steel complying with ASTM A 569/A 569M and complying with the dimensional tolerances in ASTM A 500.
   5. Malleable-Iron Castings: ASTM A 47 (ASTM A 47M 0, grade required by structural loads.
   6. Support Cable: 1/4-inch- (6-mm-) diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation.
   7. Support Chain: Proof coil chain, complying with ASTM A 413/A 413M, Grade 30, size and diameter as required by structural loads; plated or painted. Provide fittings complying with chain manufacturer's written recommendations for size, number, and method of installation.

C. Particleboard: ANSI A208.1.

D. Wood-Based, Structural-Use Panels: Comply with DOC PS 2; for plywood, comply with DOC PS 1.

E. Equipment Mounting Pads: Wood, transparent painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's current written recommendations.

F. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed tamperproof, vandal and theft resistant. Provide as required for gymnasium equipment assembly, mounting, and secure attachment.

G. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

2.03 BASKETBALL EQUIPMENT:

A. General: Provide equipment complying with requirements in the Alabama High School Athletic Association’s and NFHS’s Basketball Rule Books. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

B. Overhead-Supported Backstops: Complete assembly spanning height indicated on Drawings, including primary and secondary superstructure support framing to building structure, pipe and cable bracing, adjustable hangers, clamps, cables, chains, pulleys, fittings, hardware, and fasteners. Overhead backstop support shall be compatible with Folding Type listed below.
   1. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
      a. Center Mast: All welded construction with side sway bracing of pipe.
      b. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; black.
   2. Folding Type: Provide manufacturer's standard assembly for side-folding backstop where indicated, with hardware and fittings to permit folding.
   3. Goal Height Adjuster: Adjustable from 8 to 10 feet (2.4 to 3 m) with crank mechanism, locking in any position within adjustment range, with visible height scale and finish matching framing.
   4. Operation: Electrically operated.

C. Backstop/Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb (2722-kg) load capacity, unless higher capacity is recommended in writing by backstop manufacturer; Provide one per folding backstop.
   1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; Provide one per folding backstop.

D. Basketball Backboards: Provide predrilled holes or preset inserts for mounting goals.
   1. Description: Rectangular, 72 by 42 inches (1800 by 1050 mm) width by height, fabricated from the following:

a. Glass: Not less than 1/2-inch- (12-mm-) thick, transparent tempered glass. Provide glass with impact-absorbing, resilient rubber or PVC gasket around perimeter in a fully welded brushed-natural-finish, heavy extruded-aluminum frame, with steel subframe, reinforcement, and bracing, including center-strut frame reinforcement, and with mounting slots for mounting backboard frame to backstop support framing.
b. Direct Mount: Designed for mounting backboard frame to center mast of backstop framing to maximize relief of stresses on backboard frame and glass.

2. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
3. Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.

E. Goal Mounting Assembly: Compatible with goal, backboard, and support framing.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
2. Direct Mount: Designed for mounting goal directly and independently to center mast of backstop support framing so no force, transmitted by ring, is directly applied to backboard and rigidity and stability of goal are maximized.

F. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
3. Mount: Rear mount.
4. Net Attachment: No-tie loops for attaching net to rim without tying.
5. Finish: Manufacturer's standard factory-applied, electrostatic baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; orange.

G. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (400 to 450 mm long), official sized to fit rim diameter, and as follows:
1. Competition Cord: Antiwhip, made from white nylon cord not less than 120 gm nor more than 144 gm thread.

H. Portable Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
2. Height: Adjustable to 8'-0", 9'-0", and 10'-0".
3. Backstop Base Size: 4'-5-1/2" W x 6'-3-3/4" L (including padding)
4. Base Features:
a. Non-marking, rubber tread caster wheels with roller bearings.
b. Auto-retract foot pad at front of base.
c. Docking tray floor anchor system.
d. Concealed handwheel mechanism with roller thrust bearing.
5. Backboard shall include cutouts to provide a concealed raceway for shot clock.
6. Shot clock support frame shall be made of unitized 3" diameter, 1/4" thick wall aluminum tubing.

I. Safety Pads: Provide safety pads, complying with referenced standards, designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
1. Safety Pad Attachment: Bolt-on.
2. Color: As selected by Architect from manufacturer's full range of fifteen (15) standard colors, minimum.

J. For motorized goals and other electrical equipment in this Section, Manufacturer shall coordinate junction box with switch plate in field.

2.04 VOLLEYBALL EQUIPMENT:

A. General: Provide equipment complying with requirements in referenced standards.

B. Floor Inserts: Chrome-finished steel floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to securely anchor pipe sleeve below finished floor in concrete with anchors designed for securing floor insert to floor substrate indicated; one per post standard.
   1. Floor Plate: Lockable, manufacturer's standard hinged access cover, designed to be flush with adjacent flooring. Provide two tools for unlocking access covers.

C. Post Standards: Removable, paired volleyball post standards as indicated on Drawings. Adjustable height. Designed for easy removal from permanently placed floor insert supports. Fabricated from steel and extruded-aluminum or manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
   1. Nominal Pipe or Tubing Diameter: 3-1/2-inch (89 mm) OD at base.
   2. Net Height Adjuster: Manufacturer's standard mechanism for height adjustment, complete with fittings; designed for positioning net at heights indicated.
      a. Net Heights: Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches (910 and 2430 mm) or more.
   3. Height Markers: Clearly marked at regulation play heights for elementary school, girls/women, boys/men, sitting volleyball, and tennis.
      a. Include as minimum the following height markers for adult through youth: 7'-11-5/8", 7'-9-5/8", 7'-6", 7'-4-1/8", 7'-2-1/8", 7'-0", 6'-6", 6'-4", 6'-0", and 5'-0".

D. Net: 32 feet (9.75 m) long, 39 inches tall, and as follows; 1 per pair of paired post standards:
   1. Width and Mesh: 39 inches with 4-1/2-inch- (110-mm-) square mesh made of black polyester string.
      a. Hem Band Edges: White, 2-inch- (50-mm-) wide top binding, black, 1-inch-
         1) (25-mm-) wide bottom and side bindings, tie offs at top and bottom of each side end of net, and 1/4-inch- (6-mm-) diameter rope, at least 42 feet (12.8 m) long, threaded through top hem of binding.
      b. Top Line: Not less than 1/8-inch- (3-mm-) diameter, galvanized or coated steel cable.
      c. Bottom Line: Not less than 1/8-inch- (3-mm-) diameter, galvanized or coated steel cable.
   2. Dowels: Not less than 1/2-inch- (12-mm-) diameter fiberglass or 1-inch- (25-mm-) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.

E. Net Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip worm-gear, rack-and-pinion type, or ratchet-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and removable handle. Mount net tensioner on post standard at side away from court play. Provide end post with post top pulley. Provide opposing post with welded steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.

F. Safety Pads: Comply with NCAA and NFHS requirements. Provide pads consisting of not less than 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant manufacturer’s standard polyurethane, or cross-linked or closed-cell polyethylene foam filler covered by puncture- and tear-resistant, not less than 14-oz. (397-g) PVC-coated polyester, or not less than 14-oz. (397-g) nylon-reinforced PVC fabric cover, treated with fungicide for mildew resistance, with fire-test-response characteristics indicated. Provide pads with hook-and-loop closure or attachments for the following components:
   1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches (1830 mm); 1 per post.
   2. Net Lines: Four per net.
   3. Fabric Cover Flame-Resistance Ratings: Passes NFPA 701.
   4. Fabric Color: As selected by Architect and Owner from manufacturer's full range of standard color selections (15 minimum color options).

G. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.

H. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch- (910-mm-) wide or wider door openings. Fabricate units of welded steel tubing with heavy-duty casters, including not less than two swivel casters. Fabricate wheels from materials that will not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

I. Judge's Stand: Provide judge's stand which connects to volleyball net post standard. Provide with platform-support side frames, platform, ladder, handrail (extending 38" nominal above platform). Provide with lower end of ladder equipped with heavy-duty diameter, non-marking rubber pads. Side frames shall also be equipped with 3" diameter, non-marking caster wheels positioned for ease of tipping and transporting to storage area. Metal frames and ladder rungs shall be finished in durable powder-coated finish. Platform shall be coated with non-slip top surface. Top of platform shall be 3'-10" above playing surface while in use. Product shall be Porter No. 00999-000 Judge's Stand with Protective Padding Set, or approved equal, and shall be compatible with net post standard used.

2.05 SAFETY PADS:

A. Wall Safety Pads in Gym as indicated on drawings: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric cover, free from sag and wrinkles and firmly attached to back of backer board.
   1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick exterior-grade plywood, mat-formed, or composite panel.
   2. Fill: Multiple-impact-resistant foam not less than 2-inch- (50-mm-) thick bonded polyurethane foam, 6-lb (2.7-kg) density.
   3. Size: Each panel section, 24 inches (600 mm) wide by not less than 72 inches (1800 mm) long.
   4. Number of Panel Sections:
      a. As indicated on the Drawings.
      b. 2-sided pads flush-mounted against and installed directly on each outside building corner exposed around basketball courts when bleachers are retracted from open position (24-inches x 24-inches sections wrapping corners); and
      c. 3-sided pads flush-mounted against and installed directly on each building column which protrudes from face of interior walls, following the contour and taper of columns up to the required 72-inch pad heights.
   5. Installation Method: Concealed mounting Z-clips, or manufacturer’s standard mounting method, when acceptable to the Architect and Owner.
   6. Fabric Cover Colors: As selected by Architect and Owner from manufacturer's full range of colors, minimum fifteen (15) standard colors; Two colors may be selected.

2.06 SCORING TABLE

A. Provide scoring table.

B. Color: To be selected by Architect

C. Size: 96-inches long x 31-inches high x 31-inches deep, nominal.

D. Capable of folding to 16-inch width.

E. Provide back-lit panels on front for school name and mascot, or advertising; illumination by recessed fluorescent tubes with polycarbonate covers to reduce glare onto court, covered with shatterproof lexan.

F. Provide with non-marking wheels to protect gym floor.

G. Provide with electronic possession/ bonus indicator panel.

H. Manufacturer:
   1. Allied Scoring Tables: www.alliedscoringtables.com.
   2. GV Pro.: www.gvprotables.com.
   3. Varsity Image: www.varsityimage.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.07 SHOT CLOCK

A. Provide 2 shot clocks per court. Location to be approved by Owner prior to installation.

B. Color: To be selected by Architect from full range of manufacturer colors.

C. Size: 26-inches long x 25-inches high x 6-inches deep, nominal.

D. Provide with wireless play/shot clock remote controller.

E. Provide with 15" LED digits.

F. Manufacturer:
   1. Allied Scoring Tables: www.alliedscoringtables.com.
   2. GV Pro.: www.gvprotables.com.
   3. Varsity Image: www.varsityimage.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance.
   1. Verify critical dimensions.
   2. Examine supporting structure and below finished floor for subfloors and footings.
   3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL:

A. General: Comply with manufacturer's current written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.

B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.

C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
   1. Floor Insert Locations: Coordinate location with application of game lines and markers.
   2. Floor Insert Elevations: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and type of floor plate.
   3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.

D. Floor Insert Setting: Grout sleeve for post standards in oversized, recessed voids in concrete slabs and footings. Clean holes of debris. Position sleeve and fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor and footing from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.

E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.

3.03 ADJUSTING:

A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.04 CLEANING AND PROTECTION:

A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure gymnasium equipment is without damage or deterioration at time of Substantial Completion.

C. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.05 DEMONSTRATION:

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 1 Section "Project Closeout".

END OF SECTION

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SECTION 11 6653
GYMNASIUM DIVIDER CURTAIN

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY:

A. This section shall include the furnishing of all equipment and labor necessary to complete the Gymnasium Roll Up Divider Curtain, and all equipment shown on the drawing and herein specified. All equipment shall be supplied by one manufacturer.
   1. Include all pieces and connections for attachment of roll-up curtain and accessories to overhead structural steel, including but not limited to, beam clamp assembly, welded drop pipe, hanger brackers, threaded rods and nuts, etc.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Structural steel support framing required for Divider Curtain attachments.

B. Finished painting at job site after final installation shall be by painting contractor.

C. All electrical and final connections shall be by the electrical contractor.

1.04 APPROVALS:

A. Submit request for approvals 10 days prior to bidding.

1.05 SUBMITTALS:

A. List of proposed products and product data, and specifiations.

B. Loads to be transmitted to building structural members and requirements for supplementary bracing and structural support members.

C. Shop Drawings showing layout, elevations, dimensions, fabrication details, methods of attachment and electrical diagrams.

D. Show location and detail of attachment to building structure. Include shop drawings of any and all items required to connect divider curtain to structure overhead.

E. Manufacturer shall provide calculations and reports for tests performed by an independent testing laboratory that clearly demonstrates compliance with minimum safety factors included in product specifications.

F. Submit color and fabric samples for Gymnasium Divider Curtain Vinyl and Mesh.

G. Indicate each item being furnished including materials, quantities, locations, connections, and fasteners. Include dimensioned layout of equipment locations.

H. Submit a copy of manufacturers Certificate of Insurance.

I. Submit test data requested. Same shall be from a licensed independent testing company and shall be data on parts specifically requested.

J. Submit a copy of additional guarantee/warranty information for indicated items with shop drawing submittals.

1.06 WARRANTY:

A. Provide a one year warranty against defects in materials and workmanship along with any other warranties provided by the manufacturer.

1.07 QUALITY ASSURANCE:

A. While it is not the intent to limit competitive bidding, the manufacturer and equipment specified in listed as a standard of quality, durability, and performance. Items furnished shall be of the same manufacturer to assure similar operation, safety, routine maintenance and service.

B. Support assemblies between divider curtain and overhead steel structure shall be designed and stamped by licensed professional engineer.

C. All welding shall be performed by personnel having passed Welder Qualification testing in accordance with American Welding Society (AWS) code D1.1 or higher. Manufacturer shall provide certification and test results upon request.

1.08 DELIVERY, STORAGE AND HANDLING:

A. Do not deliver divider until building is enclosed and other construction within gymnasium is substantially complete.

1.09 PROJECT CONDITIONS:

A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Do not install divider curtain until gymnasium flooring and other interior construction is essentially complete.

C. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment. Verify dimensions by field measurements.

1.10 COORDINATION:

A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.

B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.01 MANUFACTURER:

A. Draper, Inc.; [Basis of Design]: www.draperinc.com.
   1. Other Manufacturers:
      a. Arizona Courtlines, Inc.: www.arizonacourtlines.com.
      b. Performance Sports Systems: www.perfsports.com.

B. The approval of other manufacturers names and product number do not relieve the contractor from furnishing products which comply with all of the detailed requirements of the base specification.

C. Manufacturers products shall be standard catalogued items and shall be a consistently offered line of equipment. Manufacturers published literature must clearly show that the products being furnished are in compliance with these specifications, otherwise, a detail listing of differences if required prior to bid.

D. Manufacturers in order to be considered must have at least five (5) years of experience producing equipment of the type and design specified. Manufacturer must be able to furnish a reference list of recent projects with similar products in compliance with these specifications.

E. Substitutions: Section 01 6000 – Product Requirements.

2.02 PRODUCTS:

A. "Roll-Up Gym Divider", manufactured by Draper, Inc.

B. "Roll-Up Gym Divider Curtain, manufactured by Arizona Courtlines, Inc.

C. 4030 Roll-Up Gym Divider Curtain, manufactured by Performance Sports Systems.

2.03 DESCRIPTION AND MATERIALS, GENERAL:

A. Roll-Up Divider Curtain:
   1. Electrically operated, roll-up gymnasium divider including motor, belts, controls, clamps for attachment to building structure, threaded pipe supports, and other components required for complete functional installation.

2. Operation: Curtain rolled up and down by belts wound onto overhead rotating drive pipe operated by electrical motor.
3. Lower section of curtain shall be solid vinyl coated polyester (avg. 18 oz. per square yard as required). Flammability rated as self extinguishing by the California State Fire Code and Class A Rated in accordance with requirements of NFPA-101. All seams to electronically welded with a 1" full contact weld. Outer edge hems shall be triple turned with double welds. A pocket shall be formed along the bottom edge of the curtain to accommodate a 1-5/8" diameter round batten for curtain support. Lower section of curtain shall be 8 feet high A.F.F.
4. Upper section of curtain shall be avg. 9 oz. per square yard vinyl coated polyester mesh. Flammability rated as self extinguishing by the California State Fire Code and Class A Rated in accordance with requirements of NFPA-101. Color shall be chosen from eleven standard colors. Use vinyl fabric, in triple thickness and double welded to the top edge of the mesh, to form a 6" wide pocket to accommodate a 1-5/8" diameter round batten for curtain support.
5. Operating mechanism: Drive pipe winch powered with 3/4 HP, 110VAC, 60-cycle, single-phase, reversible capacitor, C-Face motor with thermal overload protection. Entire winch assembly to be UL listed and shall carry a five-year warranty. Provide with load holding worm gear reduction and integral limit switches to control curtain travel. Drive pipe shall rotate in pipe support assemblies spaced at approximately 9 feet.
6. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2 inch diameter threaded rods. Attachment clamps designed to be capable of supporting a minimum of 5,000 lbs each and provided in sufficient number to provide a combined minimum 45:1 attachment point safety factor.
7. Hoist belts: 5 inches wide polyester webbing attached to drive pipe, passing under bottom batten, and terminating at top batten. Space belts at approximately 15 feet.
8. Bottom roller: 3-1/2 inches diameter steel pipe with aluminum strip for attachment of curtain.

B. **CURTAIN SAFETY DEVICE:**
1. Provide curtain safety device to be directly speed sensitive to automatically lock divider curtain in position at any time during storage or operation. In the event of an over-speed situation (greater than 1.5 feet per second) caused by malfunction of the hoisting apparatus, whether sudden or gradual, device will immediately activate. Curtain safety device shall work regardless of direction of rotation and shall automatically reset when load is reversed or removed.

C. **CONTROLS:**
1. Provide key lock, 3-position, momentary contact wall control switch to lower, raise, and stop gymnasium divider. Provide with switch box and plastic cover plate.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine work in place on which specified work is in any way dependent to ensure that conditions are satisfactory for installation of specified work. Report in writing to the General Contractor and the Architect any defects which may influence completion of specified work. Absence of such notification will be construed as acceptance of work in place. Do not attempt installation until correct conditions are present of you have written order to do so.

3.02 INSTALLATION, GENERAL:

A. Equipment herein before specified shall be installed by factory trained craftsmen skilled in their trade who will be responsible for accurate fit of specified work.

B. Install and assemble all equipment furnished in accordance with manufacturer's instructions and approved shop drawings. This contractor shall adjust gymnasium divider curtain for plumb and level. This contractor shall set and adjust electric winch upper and lower limit controls. Demonstrate operation of all units to the owner or his authorized agent.

C. The installing contractor shall be responsible for proper inspection and installation of all wall panels. Installation shall be made in accordance with current factory suggested procedures. All cut-outs or forming of panels around columns shall be done in field to assure accuracy.

END OF SECTION

SECTION 12 2414
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manually operated sunscreen roller shades.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 06 1000 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

C. Section 09 2116 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

D. Section 09 5100 - Suspended Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.03 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.
   5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

E. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

F. Mock-Up: Provide a mock-up (for both manual and electrical shades) of one roller shade assembly for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window designated by Architect.
   2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.08 WARRANTY

A. Shade Fabric: Manufacturer's 10-year warranty.

B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

C. Roller Shade Hardware, and Chain: 5 years warranty against defects in materials and workmanship.

D. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Caco, Inc.

B. Draper, Inc.; "Access FlexShades" [Basis of Design]: www.draperinc.com.

C. Lutron: www.lutron.com.

D. MechoShade Systems, Inc. www.mechoshade.com.

E. Substitutions: Section 01 6000 - Product Requirements.

2.02 SHADE CLOTH

A. Light-Filtering Fabrics:
   1. SheerWeave Series SW2900 Series by Phifer: VOC Emissions: GREENGUARD and GREENGUARD Gold - certified as a low-emitting fabric. Composition: 38% Fiberglass, 62% Vinyl on Fiberglass. Fire rating: NFPA 101 (Class A Rating). Bacteria and Fungal Resistance: ASTM E 2180; ASTM G 21AATCC30 Part 3; ASTM D 3273; GREENGUARD Mold and Bacteria Standard ASTM 6329. Include Microban antimicrobial additives. Mesh Weight: 14.1 oz/sq yd. Openness Factor - Approx. 1 percent. UV Blockage - Approx. 95 Percent. Fabric thickness: 0.022 inches.

B. Color and Pattern: As selected by Architect from manufacturer's standard range.

2.03 MANUAL WINDOW SHADES

A. Type: Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation. Includes aluminum housing with installation to be coordinated with ceiling system installation. Provide brackets, fasteners, and other components necessary for complete installation.

B. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too

far.

1. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon.
2. Bead chain loop: Stainless steel bead chain hanging at side of window.

C. Roller: Fabricated from extruded aluminum or steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade size. Provide with roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.

D. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.

E. Endcap covers to match fascia/headbox finish.

F. Shade slat: Slat encased in heat seamed hem.

G. Headbox Ceiling/Wall Style: Aluminum fabrication with removable closure, endcaps, and back and top cover piece:
1. Finish: Powder coat color as selected by Architect.

H. Location: In Administrative Spaces. See Drawings.

2.04 ACCESSORIES

A. Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings where indicated on the Drawings.
1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
a. Provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.

B. Fascia, where required for non-recessed mounting:
1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.04 TESTING AND DEMONSTRATION

A. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.

B. Demonstrate operation of shades to Owner’s designated representatives.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3219
LAMINATE CASEWORK

PART 1 - GENERAL

1.01 SUMMARY

A. The General Contractor, at its option, may furnish and install Custom Architectural Woodwork (Millwork) in lieu of the Casework specified in this Section. See Section 06 4000 - Custom Architectural Woodwork for requirements.

1.02 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.

B. Section 06 1000 - Rough Carpentry.

1.03 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.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain entrance mats, grates, and frames from a single manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing specified mats and grates with minimum three years documented experience.

C. Installer Qualifications: Company specializing in installing mats and grates with minimum three years documented experience and approved by carpet tile manufacturer.

D. Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux minimum 0.45 watts/ SM.

E. Slip Resistance: Per ASTM D 2047-96, Coefficient of Friction 0.60 when wet, or better.

1.05 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: 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".

1.06 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.

1.07 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 Section 10 & Section 11, 1st Edition, Oct. 2009, 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.

1.08 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.

1.09 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.

1.10 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.

1.11 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.

B. Pulls:
1. Wire pulls equivalent to Stanley No. 4484, stainless steel, satin finish (ANSI B12012), 4-inches long, with 1-inch clearance; finish to match Section 08710 - "Finish Hardware" finish in room(s) where occurs. Pull design shall comply with the Americans with Disability Act (ADA).

C. 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.

D. Adjustable Shelf Supports:
1. Injection molded transparent polycarbonate friction shall fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support shall have 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall automatically adapt to 3/4 inch or 1 inch thick shelving and provide a non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

E. Locks:
1. Shall be standard removable core, disc tumbler, cam style lock for drawer with strike. Furnish 2 keys.

F. Coat Rods: Shall be 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

G. 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
9. Adjustable shelf core: 1 inch thick particleboard up to 36 inches wide, 1-inch thick particleboard with corrugated metal ribbed stiffener for shelves over 36 inches wide.
   a. Front edge: 1mm PVC.
10. Interior finish, units with open Interiors:
    a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with VGS High Pressure decorative laminate. Match exterior finish.
11. Interior finish, units with closed Interiors:
    a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back. Color to be selected by Architect.
12. Exposed ends:
    a. Faced with VGS high-pressure decorative laminate.
13. Wall unit bottom
    a. Faced with thermally fused melamine laminate.
14. Wall and tall unit tops:
    a. Top surface is faced with thermally fused melamine laminate.
15. Balanced construction of all laminated panels is mandatory.
16. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.
17. Provide specified grommets in bracket supported countertops. 1 per 5'-0" of countertop. Locations to be determined by Architect.

C. Drawers:
   1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC. Full height sides.
   2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
   3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

D. Door/Drawer Fronts:
   1. Core: 3/4 inch thick particleboard.
   2. Provide double doors in opening in excess of 24 inches wide.
   3. Faces:
      a. Exterior: VGS High-pressure decorative laminate.
      b. Interior: High-pressure cabinet liner CLS.
   4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

E. Miscellaneous Shelving: Location: Classroom storage closets.
   1. Core material: 3/4 inch or 1 inch particleboard, as required.
   2. Exterior & Interior: VGS High-pressure decorative laminate.
   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.

END OF SECTION

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SECTION 12 6613
TELESCOPING SEATING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Manufacture, deliver and install Telescopic Seating Systems in accordance with applicable codes, the following specifications, and approved drawings.

1.02 RELATED WORK BY OTHERS

A. Adequate floor levelness and strength for operation of telescopic seating.

B. Adequate wall strength for attachment and operation of wall attached telescopic seating.

C. Electrical wiring within the building as required for power operated telescopic seating.

1.03 SYSTEM DESCRIPTION

A. Telescopic seating system shall be multiple tiered seating rows comprised of seat and deck components, risers, and supportive understructure.

B. Telescopic seating shall be operable on the telescopic principle, stacking vertically in minimum floor area when not in use.

C. The first moving row, on manual sections, shall be secured with release lever. All other rows shall be mechanically locked, operable only upon unlocking and cycling of first row. Power sections shall be secured with mechanical locks as well as the power system, operable upon activating the pendant control.

1.04 QUALITY ASSURANCE

A. DESIGN LOAD CRITERIA (STRUCTURAL):
   1. International Building Code Standard: Comply with requirements of IBC / ICC 300, Chapter 4 "Standard for Bleachers, Folding and Telescopic Seating and Grandstands Assembly Seating," except where other requirements are indicated by the architect/owner.

B. Partial Loading Requirements: Telescopic seating governed by IBC 2018, ICC-300 2017, NFPA 102 2016 or NFPA 5000 2018 shall all comply with ASCE 2016, Section 4.3.3 Partial Loading.

C. Manufacturer: Company specializing in telescopic seating with a minimum of 25 years' experience in manufacturing telescopic seating.

D. Engineer Qualifications: Manufacturer to employ a registered, licensed Professional Engineer to certify that the equipment to be supplied meets or exceeds the design criteria of this specification.

E. Installation: Shall be handled directly by the manufacturer or by a factory certified installation subcontractor.

F. Product Liability: Certification of insurance coverage of not less than $5,000,000.

G. Welding Processes: To be performed by certified professional welding operators in accordance with American Welding Society – Certified Welding Fabricator, (AWS-CWF), D1,1 "Structural Welding Code-Steel."

H. Product Improvements: Equipment provided shall incorporate manufacturer's design improvements and materials current at time of shipment, provided that such improvements and materials are consistent with the intent of these specifications.

1.05 SUBMITTALS

A. BID SUBMITTALS
   1. Manufacturer's descriptive literature and specifications.
   2. List of deviations from these specifications, if any.
   3. Certification of Insurance.

B. JOB SUBMITTALS
   1. Shop Drawings showing all equipment to be furnished with details of accessories to be supplied including necessary electrical service to be provided by others. All electrical submittals must include U.L. listing number.

2. Samples of material and color finish as requested by Architect.
3. Warranty, operation and maintenance instructions to the owner upon completion.

1.06 DESIGN CRITERIA

A. Telescopic seating shall be designed to support, in addition to its own weight, and the weight of added accessories, a uniformly distributed live load of not less than 100 lbs. per sq. ft. (4.8 kN per sq. m.) of gross horizontal projection. Seat boards and footrest shall be designed for a live load of not less than 120 lbs. per linear foot (1.751 kN per linear m).

B. Sway force applied to seats shall be 24 lbs. per linear ft. (350 N per linear m.) parallel to the seats and 10 lbs. per linear ft. (146 N per linear m.) perpendicular to the seats. Sway forces shall not be considered simultaneously applied.

C. Railings, posts and sockets designed to withstand the following forces applied separately.

D. Handrails shall be designed and constructed for:
1. A concentrated load of 200 lbs. (890 N) applied at any point and in any direction.
2. A uniform load of 50 lbs. per ft. (730 N/m) applied in any direction.
3. The concentrated and uniform loading conditions shall not be required to be applied simultaneously.

E. Guards shall be designed and constructed for:
1. A concentrated load of 200 lbs. (890 N/m) applied at any point and in any direction along the top railing member and; a uniform load of 50 lbs. per ft. (730 N/m) applied horizontally at the required guardrail height and simultaneous uniform load of 100 lbs. per ft. (1460 N/m) applied vertically downward at the top of the guardrail. The concentrated and uniform loading conditions shall not be required to be applied simultaneously.

F. American Institute of Steel Construction (AISC), American Iron and Steel Institute (AISI) and Aluminum Association (AA) design criteria shall be the basis for calculation of member sizes and connections.

G. Wood members shall be designed in accordance with National Forest Products Association, (NFOPA), and National Design Specification for Wood Construction.

1.07 WARRANTY

A. The manufacturer shall warrant all work performed under these specifications to be free of defects for a period of one year.

1.08 ALL UNDERSTRUCTURE COMPONENTS SHALL BE WARRANTED FOR A PERIOD OF TEN YEARS.

1.09 ANY MATERIALS FOUND TO BE DEFECTIVE WITHIN THIS PERIOD WILL BE REPLACED AT NO COST TO THE OWNER. THIS WARRANTY SHALL NOT INCLUDE REPLACEMENTS REQUIRED BY ACTS OF GOD, WAR, VANDALISM, FLOOD, FIRE, CALAMITY OR DELIBERATE ABUSE OR MISUSE OF THE EQUIPMENT.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All seating shall be VersaTract Telescopic Seating System as manufactured by Irwin Seating Company - Telescopic Division, Altamont, IL 62411 or equal, subject to prior approval and strict compliance with these specifications.

2.02 MATERIALS

A. Seating Area: 3 (2,3,4) Groups 50 Feet 10 Inches Long, 4 Rows High Wall Attached, Manually Operated.

B. Dimensions:
1. Overall height: 3 Feet 4 Inches
2. Open depth: 7 Feet 3 1/8 Inches
3. Closed depth: 3 Feet 7 1/8 Inches
4. Row Spacing: 22 Inches
5. Rise per row: 10 Inches

6. Seating Area: 3 (1,5,6) Groups Feet Inches Long, 4 Rows High Wall Attached, Electrically Operated.

2.03 DIMENSIONS:

A. Overall height: 3 Feet 4 Inches

B. Open depth: 7 Feet 3 1/8 Inches

C. Closed depth: 3 Feet 7 1/8 Inches

D. Row Spacing: 22

E. Rise per row: 10 Inches

2.04 FABRICATION

A. Understructure System:

1. Steel supports and rolling frames shall be constructed from formed steel of the size and shape necessary to support the design loads. All support bracing shall begin at Row 2 and be of diagonal or "knee" type for rigidity. Diagonal bracing to be minimum 1 1/2” x 1 1/2" 14-gauge square tubing. Bracing fabricated from open-sided channel, angle iron or flat strap "X" type bracing is unacceptable.
2. Wheels shall not be less than 5" diameter x 1 3/8" non-marring soft rubber face to protect wood or synthetic floor surfaces. Each operating row shall have a minimum of 6 wheels.
3. Each fully skirted wheel channel shall be formed 12-gauge steel and continuously in contact with adjacent channels by means of an Integral Alignment System (IAS) and include nylon glides to eliminate any metal to metal contact. The IAS maintains proper alignment between adjacent wheel channels for smooth and consistent operation while eliminating the potential for accidental row separation. Wheel channel alignment systems with metal to metal contact requiring periodic lubrication or that utilizes a guide rod system that can be bent or damaged will not be acceptable.
4. Each cantilever arm shall be triple-formed 10-gauge steel, securely welded to the post assembly and include a nylon cantilever pad to ensure smooth operation. The cantilever pad shall also provide a firm base when in the occupied position and provide a solid feel when walked on.
5. Vertical columns shall be high tensile steel structural tube to meet design criteria. Minimum column size to be 2” x 3” 14-gauge structural tube, welded to a 2’ wide wheel channel using 360 degrees of weldment.
6. Deck support members shall be double formed 14-gauge steel and connect the front nosing and rear riser members. Each deck support shall include a unique dual-purpose roller that provides smooth support during operation. The deck support roller shall also include a 3/4” wide shoulder that’s encapsulated by the deck support on the row above in order to maintain proper upper alignment while delivering consistent, repeatable operation.

B. Seat Systems:

1. Infinity Seat: Supply plastic modular 18” individual seats in either 10” or 12” deep models. Seating to be scuff resistant injection molded high density polyethylene plastic.
2. 10” Infinity Seat to be supplied
   a. Seat modules supplied shall be of a high aesthetic design using multiple textures, style lines and a waterfall front. The rear of the seat shall be slightly curved to eliminate the straight line appearance and include a moderate seat contour and texture to enhance spectator comfort.
   b. Seating design shall be molded to achieve a finished end appearance without the use of end caps. The rear of the seat shall include a smooth wall allowing for the deck to be easily swept clean without obstruction.
   c. Seat heights shall be maintained at a minimum of 16 3/4". Lower seat heights which detour from spectator comfort will not be accepted.
   d. Foot space shall be maximized for spectator comfort and provide a minimum of 22” when measured with a 10” module and 21” with a 12” module.
   e. Each seat to be designed with the capability of using seat numbers and row letters at the aisle locations. Seat numbers to be stylishly designed using a radius corner to enhance the aesthetic value of the seat. Seat numbers and row letters shall be recessed into the seat to protect against any vandalism.

f. Select seating colors from manufacturer's 15 standard colors. Custom colors available as an option.
g. Securely fasten each seat to the nose beam using a 10-gauge formed steel bracket and locking hardware. Adjacent seating shall be interlocked together along the full perimeter eliminating any fore or aft movement or the potential of any pinching hazard.
h. Seat modules shall be designed to support a uniform load of 600 lbs per seat and a concentrated load of 150 lbs over 4 square inches.
i. Platform chairs shall have a modern look with complementary style lines, comfortable contours and subtle texture to achieve maximum spectator comfort.
j. Each chair to be constructed from durable, scuff resistant injection molded high density polypropylene plastic, designed to support over 700 pounds per chair.
k. Seat heights shall be maintained at a minimum of 17 ½ inches. Lower seat heights which detour from spectator comfort will not be accepted.
l. Actual seat width shall not be less than 17 ¼ inches.
m. Back heights to be a minimum of 31 ½" and designed to fold within the depth of the deck when in the stored position. Chairs extending beyond the face of the unit when closed will not be acceptable.
n. Chairs shall be rail mounted and allow for complete flexibility in chair layout. Seat spacing to be available from 18" to 24", and field adjustable.
o. Each chair shall have the capability of using seat numbers and row letters at the aisle locations. Seat numbers and row letters to have a stylish round design to enhance the aesthetic value of the seat, and be recessed to protect against vandalism.
p. Select seating colors from manufacturer's 15 standard colors. Custom colors available as an option.
q. Securely fasten each chair and arm assembly to a heavy-duty, clear anodized aluminum rail using locking hardware.

C. Deck System:
1. Panelam decking shall have a 0.030 (30 thousandths) high density polyethylene overlay, permanently bonded over a structural deck panel meeting all flooring load requirements. Deck panels shall be supported along the front and back edge for maximum rigidity and connected using a tongue and groove splice leaving the deck clean and free of any tripping or cleaning obstructions. Decking shall be secured in place by the encapsulation of the rear riser and mechanical fasteners along the front edge. Panelam to be selected from manufacturer's standard colors. Finish thickness to be 5/8".

D. Nosing:
1. Nosing shall be one piece, formed, 14-gauge steel with a minimum G-60 pre-galvanized finish.

E. Rear Risers:
1. Rear riser shall be one piece, formed, 14-gauge steel with a minimum G-60 pre-galvanized finish.

F. Finish: For rust resistance in standard conditions all painted surfaces shall be finished in textured Epoxy Powder Coated Semi-Gloss Black.

2.05 ACCESSORIES

A. Aisles shall be footrest level 48" inches wide to provide 1 and 2 aisles. Aisles at the footrest level shall include non-slip treads on the top front edge.

B. Intermediate aisle steps shall be provided. Steps are permanently attached closed design. Steps shall be constructed from 14 ga. steel, finished in a Black powder coated epoxy, and designed to eliminate any possible toe catch between the top of the intermediate step and the bottom of the nose beam per ADA or other applicable codes. Front step shall be removable and interlock to the front row eliminating any possibility of accidental disengagement, and store on the front row when not in use.

C. Aisle handrails.
1. Smart Rail aisle handrails shall be provided for 22" to 26" row spacing. Aisle railings shall quickly and easily rotate 90 degrees to the locked position and store parallel to the front of the aisle. Railings that require removal from the pocket or the use of tools for storage will not be acceptable. Aisle railings shall be an individual rail design, located on every other row starting at row two (2). Railing to be constructed of 1 1/2" 11 ga. round steel tubing, finished in a textured powder coated epoxy. For safety, railings designed without a full return of the handrail will not be acceptable.

D. Wheel Chair Seating Areas.
   1. Recoverable wheel chair spaces shall be provided at the section joint location or section length as shown on plans. An integral support on row two shall be provided to eliminate structural damage to the understructure during the operation and use of the system. Recoverable seating areas do not require front railings for support.

E. End rails.
   1. End rails of the self-storing type, finished with textured epoxy powder-coated black enamel, shall be provided at the open ends of the group. End rails shall start at row three and be constructed from 1" square tubing to meet all national building codes. Railings with flexible uprights that can be expanded beyond the 4" sphere are not acceptable.

F. Vinyl end curtains shall be provided to limit unauthorized access to the underside of the telescopic system. Curtain to be one piece design shaped to follow the angle of the telescopic unit in the open position and constructed of a sturdy vinyl material with sewn-in grommets for attachment. Color to be selected from manufacturer's standard selection.

2.06 PROPULSION SYSTEM:

A. Bleachers shall be manually operated.

PART 3 - EXECUTION

3.01 REVIEWS AND APPROVALS

A. Shop drawings shall be approved and job site field measurements taken prior to installation and telescopic gym seating shall be installed in conformance therewith.

3.02 INSTALLATION

A. The installation of the telescopic gym seating will be handled directly by the manufacturer or by a factory authorized installation subcontractor qualified to perform the installation function.

3.03 PROTECTION

A. The manufacturer's representative shall transmit instructions in both operation and maintenance to the owner.

B. Maintenance and operation of the telescopic gym seating shall be the responsibility of the owner or his duly authorized representative, and shall include the following:
   1. During operation of the telescopic gym seating, the opening and closing shall be supervised by responsible personnel who will assure that the operation is in accordance with the manufacturer's instructions.
   2. Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the telescopic gym seating.
   3. An annual inspection and required maintenance of all telescopic gym seating shall be performed to assure safe conditions. At least bi-annually, the inspection shall be performed by a Professional Engineer or factory service personnel.

END OF SECTION

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SECTION 14 2100
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric traction elevator systems.

B. Maintenance Contract.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Includes enclosed hoistway, elevator pit, divider beams, overhead hoist beams, grouting thresholds, and grouting hoistway entrance frames.

B. Section 03 3100 - Cast-In-Place Concrete: Pit requirements, cast-in inserts or plates.

C. Section 04 2000 - Unit Masonry.

D. Section 05 5000 - Metal Fabrications: Includes sill supports.

E. Section 07 1300 - Sheet Waterproofing: Waterproofing of elevator pit walls and floor.

F. Section 09 6500 - Resilient Flooring.

G. Division 22 - Plumbing: Sump pump and pit drain.

H. Division 23 - HVAC: Ventilation and temperature control of elevator shaft and control area.

I. Division 26 - Electrical: Power systems and wiring.

J. Division 28 - Electronic Safety and Security: Monitoring and alram systems.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. AISC 360 - Specification for Structural Steel Buildings; 2022.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

E. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, Dumbwaiters, and Material Lifts; 2023.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2024.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

M. ITS (DIR) - Directory of Listed Products; Current Edition.

N. NEMA MG 1 - Motors and Generators; 2021.

O. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

R. PS 1 - Structural Plywood; 2023.

S. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other installers to provide necessary conduits for proper installation of wiring, including but not limited to, the following:
      a. Elevator equipment devices remote from elevator machine room or hoistway.
      b. Elevator pit for lighting and sump pump.
      c. Automatic transfer switch from controller cabinet.
      d. Fire alarm panel from controller cabinet.
   2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
      a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
      b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation; include provisions for shunt trip power monitoring.
      c. Overcurrent protection devices selected to achieve required selective coordination.

B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
   1. Review schedule of installation, proper procedures and conditions, and coordination with related work.

C. Construction Use of Elevator: Not permitted.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit data on following items:
   1. Signal and operating fixtures, operating panels, and indicators.
   2. Car design, dimensions, layout, and components.
   3. Car and hoistway door and frame details.
   4. Electrical characteristics and connection requirements.

C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
   1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
   2. Hoistway Components: Size and location of car machine beams, guide rails, buffers, ropes, and other components.
   3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
   4. Clearances and over-travel of car and counterweight.
   5. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
   6. Location and sizes of hoistway and car doors and frames.
   7. Electrical characteristics and connection requirements.
   8. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.

D. Samples: Submit samples illustrating car floor material, car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets, finish color selection brochures, or physical samples.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Initial Maintenance Contract.

G. Maintenance Contract: Submit proposal to Owner for standard one year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
   1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.

H. Operation and Maintenance Data:
   1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   2. Operation and maintenance manual.
   3. Schematic drawings of equipment, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on hoistway apparatus.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design guide rails under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.07 WARRANTY

A. Provide manufacturer's warranty for elevator operating equipment and devices for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - Electric Traction Elevators: KONE; MonoSpace 300 DX.

B. Electric Traction Elevators:
   1. Otis Elevator Company: www.otis.com/#sle.
   2. ThyssenKrupp Elevator: www.thyssenkruppelevator.com/#sle.

C. Source Limitations: Provide elevator and associated equipment and components produced by the same manufacturer as the other elevator equipment used for this project and obtained from a single supplier.

2.02 ELECTRIC TRACTION ELEVATORS

A. Electric Traction Passenger Elevator, 1:
   1. Interior Car Height: 108 inch.
   2. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
   3. Rated Net Capacity: 2500 pounds.
   4. Rated Speed: 150 feet per minute.
   5. Number of Stops: As indicated on drawings.
   6. Number of Openings: 1 Front; 1 Rear.
   7. Traction Machine Location: Inside the hoistway mounted on car guide rail.
   8. Control Space Location: Integrated control

2.03 COMPONENTS

A. Elevator Equipment:
   1. Guide Rails, Cables, Counterweights, Sheaves, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.

B. Electrical Equipment:
   1. Motors: NEMA MG 1.
   2. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.

2.04 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Comply with seismic design requirements in accordance with ASME A17.1, applicable local codes, authorities having jurisdiction (AHJ), and site classification.
   1. Comply with Elevator Safety Requirements for Seismic Risk Zone in accordance with ASME A17.1, ASCE 7 and other related requirements.
   2. Provide earthquake emergency operations in accordance with ASME A17.1 requirements.
   3. Provide seismic switch in accordance with ASME A17.1 and ASCE 7 requirements.

E. Perform welding of steel in accordance with AWS D1.1/D1.1M.

F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and complying with requirements of authorities having jurisdiction (AHJ).

G. Perform electrical work in accordance with NFPA 70.

H. Comply with venting or pressurization of hoistway design in accordance with HVAC system requirements and authorities having jurisdiction (AHJ).

I. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ); see Section 21 1300.

2.05 OPERATION CONTROLS

A. Elevator Controls: Provide landing operating panels and landing indicator panels.
   1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
   2. Landing Indicator Panels: Illuminating.
   3. Comply with ADA Standards for elevator controls.

B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, and building management control systems.

C. Door Operation Controls:
   1. Program door control to open doors automatically when car arrives at floor landing.
   2. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

D. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
   1. Designated Landing: Main Lobby.

2.06 OPERATION CONTROL TYPE

A. Single Automatic (Push Button) Operation Control: Applies to car in single elevator shaft.
   1. Refer to description provided in ASME A17.1.
   2. Set system operation so that momentary pressure of landing button dispatches car from other landing to that landing.
   3. Allow call registered by momentary pressure of landing button at any time to remain registered until car stops in response to that landing call.
   4. If elevator car door is not opened within predetermined period of time after car has stopped at terminal landing allow car to respond to call registered from other landing.

2.07 SERVICE CONTROL TYPE

A. Independent Service Control:
   1. Provide key operated "Independent Service" on car operating panel. Key activation will remove that car from normal operation and cancel pre-registered car calls.
   2. Car will respond to selected floor. Car will not respond to any calls from landing call buttons. Car will only respond to calls placed on the car operating panel. Doors will remain open at last landing requested. Doors will close with a constant pressure on "Door Close" button.
   3. Key activation to normal operation will return car to normal operation.

2.08 EMERGENCY POWER

A. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.

B. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.

C. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.

D. Provide operational control circuitry for adapting the change from normal to emergency power.

E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.09 MATERIALS

A. Rolled Steel Sections, Shapes, Rods: ASTM A36/A36M.

B. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

C. Stainless Steel Sheet: ASTM A666, Type 441; No. 4 Brushed finish unless otherwise indicated.

D. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

E. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.

F. Plywood: PS 1, Structural I, Grade C-D or better, sanded.

G. Resilient Flooring: Sheet flooring, as specified in Section 09 6500.

2.10 CAR AND HOISTWAY ENTRANCES

A. Elevator, ELEV:
   1. Car and Hoistway Entrances, Each Elevator Floor Lobby:
      a. Framed Opening Finish and Material: Brushed stainless steel.
      b. Car Door Material: Stainless steel, with standard panel construction.
      c. Hoistway Door Material: Stainless steel, with standard panel construction.
      d. Door Operation: Side opening, two speed.
      e. Door Width: As indicated on drawings.
      f. Door Height: As indicated on drawings.
      g. Sills: Extruded aluminum.

B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.

C. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to eliminate audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

2.11 CAR EQUIPMENT AND MATERIALS

A. Elevator Car, ELEV:
   1. Car Operating Panel: Provide main; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, and alarm button.
      a. Panel Material: Stainless steel; one per car.
      b. Car Floor Position Indicator: Above car operating panel with illuminating position indicators.

c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 48 inch above car finished floor.
d. Provide matching service cabinet integral with front return panel, with hinged door and keyed lock in each car.
e. Provide following within service cabinet as part of car operating panel:
1) Switch for each auxiliary operational control, keyed.
2) Switches for fan, light, and inspection control.
3) Telephone cabinet and hard-wired connection with telephone.
4) Convenience outlet receptacle; 110 VAC, 15 amps.

2. Ventilation: Two speed fan with perforations in wall base.
3. Flooring: Luxury Vinyl Tile.
4. Wall Base: Recessed stainless steel, 4 inch high.
5. Front Return Panel: Stainless steel.
6. Door Wall: Stainless steel.
7. Side Walls: Stainless steel.
8. Rear Wall: Stainless steel.
9. Hand Rail: Stainless steel, at rear wall. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
a. Stainless Steel Finish: No. 4 Brushed.
10. Ceiling:
a. Canopy Ceiling: Stainless steel.
b. Lighting: Recessed LED.
11. Car Accessories:
a. Certificate Frame: Stainless steel frame glazed with clear polycarbonate, and attached with tamper-proof screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this work.

B. Verify hoistway shaft and openings are of correct size and within tolerance.

C. Verify that electrical power is available and of correct characteristics.

3.02 PREPARATION

A. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

A. Coordinate this work with installation of hoistway wall construction.

B. Install system components, and connect equipment to building utilities.

C. Mount machines and motors on vibration and acoustic isolators.
1. Place on structural supports and bearing plates.
2. Securely fasten to building supports.
3. Prevent lateral displacement.

D. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.

E. Install guide rails to allow for expansion and contraction movement of guide rails.

F. Accurately machine and align guide rails, forming smooth joints with machined splice plates.

G. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

H. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime with two coats.

I. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.

B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for additional submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

3.07 PROTECTION

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until date as established by Owner.

C. Touch-up, repair, or replace damaged products and materials before Date of Substantial Completion.

3.08 MAINTENANCE

A. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for twelve months from Date of Substantial Completion.

B. Submit proposal for continuation of Maintenance Contract in accordance with ASME A17.1 and requirements as indicated for installed elevator equipment.

C. Include systematic examination, adjustment, and lubrication of elevator equipment.

D. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.

E. Replace wire ropes when necessary to maintain the required factor of safety.

F. Perform work without removing cars from use during peak traffic periods.

G. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

H. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION

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THE CITY OF RAINBOW CITY
RAINBOW CITY RECREATION CENTER
Rainbow City, AL

Bernhard TME, LLC Project # 12-23-0116
Client Project # ABHM230021

Index

SECTION 21 0451
GENERAL FIRE PROTECTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 – Section "ALTERNATES": Coordinate related Division 21 work and modify surrounding work to integrate the Work of each Alternate.

1.2 SUMMARY

A. Description of General Fire Protection Requirements. Applies to all Division 21, Section 210450's (Fire Protection).

1.3 DEFINITIONS

A. "Provide" means to furnish and install, complete and ready for operation.

1.4 REFERENCES

A. ASME: American Society for Mechanical Engineers.

B. ASTM: American Society of Testing and Materials.

C. AWWA: American Water Work Association.

D. FM: Factory Mutual.

E. NEMA: National Electrical Manufacturer's Association.

F. NFPA: National Fire Protection Association.

G. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.

H. UL: Underwriters Laboratories, Inc.

1.5 REGULATORY REQUIREMENTS

A. Comply with current edition, unless otherwise noted, of the following codes and standards.
1. ASME B31.9 - Building Services Piping.
2. ADA - American's with Disabilities Act.
3. NFPA 13 – Installation of Sprinkler System.
4. NFPA 54 – National Fuel Gas Code.
5. NFPA 70 - National Electrical Code.
6. NFPA 101 - Life Safety Code.
7. IBC - International Building Code with Fire, Mechanical, Plumbing and Gas Codes; 2015 Edition.
8. IFC – International Fire Code, 2015 Edition.

B. Permits, Licenses, Inspections and Fees.
1. Obtain and pay for all permits, licenses, inspections and fees, and comply with all rules, laws and ordinances pertaining to the Contractor's portion of the Work.
2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.6 PRODUCT REQUIREMENTS

A. Provide new standard, materials throughout.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Substitutions:
1. Comply with the provisions of Division 01, Section "Product Requirements" and the following:
2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor's bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor's proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.
3. The basis of design manufacturer's equipment has been used to determine space requirements. Should

another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.

4. The basis of design manufacturer's equipment and scheduled Fire Protection equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
   a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
   b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.
   c. Prior to approval of submittals of Fire Protection equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
5. Each bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:
   a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
   b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
   c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.
6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

D. Value Engineering / Value Analysis (VE/VA)
   1. If this project undergoes a value engineering or value analysis process, the Contractor/Bidders are required to do the following:
      a. If the Contractor's VE or VA offering is based on products other than the scheduled or specified **basis of design.** The Contractor shall inform all trades of the offering so the effect on other trades is included in the General / Mechanical Contractor's proposal. Coordination with other trades for substituted equipment or use of products, other than the named basis of design, shall be the responsibility of the Contractor furnishing the equipment.
      b. The Contractor shall be responsible for determining that offered equipment will fit space allocated. Submission of the VE or VA offering shall be considered as indicating that the Contractor has reviewed the space requirements and the equipment will fit in the space allocated with due consideration given to access required for maintenance and code purposes.
      c. The burden of proof of the merit of the proposed substitute is upon the proposer.

1.7 SUBMITTALS

A. Submit under provisions of Division 01, Section "Submittal Procedures" and the following:

B. Sprinkler calculations and shop drawings shall be designed under the direction of a professional engineer licensed in the State of Alabama. Engineer shall sign and seal each drawing sheet, and the cover sheet for the hydraulic calculations, as required by the State Board of Professional Engineers and Land Surveyors and the State Fire Marshal for the State of Alabama.

C. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 210450 Sections of Division 21.
   1. List shall be complete with manufacturer's names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.

2. Call attention to deviations from specified items as to operation and physical dimensions.
3. Performance curves for pumps shall be included.
4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted".
5. Submittals shall be submitted electronically:
   a. Initial submittal should include a complete index for each type of equipment to be submitted.
   b. Submittals shall be submitted by Section. Do not include products or materials from multiple sections in a single electronic file.
   c. Submittals shall be generated via printing to PDF files, not from scanning (scanned files are too large and difficult to manipulate).

D. Shop Drawings: Before starting work, submit and obtain approval from Architect of detailed drawings of the following, fully dimensional (including elevations of ductwork and piping) and drawn to 1/4" to 1'-0" scale. Submit electronic file of each drawing in PDF format. Engineer will return electronic copy of marked-up drawings. Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation.
1. Fire Protection Systems. See Division 21, Section "Fire Protection System."
2. For multi-story buildings, submit detailed floor penetration sleeve layout drawings. See Division 21, Section "Basic Fire Protection Materials and Methods," Article "Informational Submittals."

1.8 COORDINATION DRAWINGS

A. General:
1. Within 60 days of Notice to Proceed provide Coordination Drawings for the building.
2. Do not base Coordination Drawings on reproduction of Contract Documents or standard printed data.
3. Submitted Coordination Drawings are for information only and typically will not be returned to the Contractor. Architect will not take any action, but may define coordination conflicts or problems and inform the Contractor of such conflicts or problems.

B. Content:
1. Project specific information, drawn accurately to scale.
2. Show sequencing and spatial relationship of separate units of work that must function in a restricted manner to fit in the space provided, or function as indicated.
3. Indicate dimensions shown on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

C. Format:
1. Coordination shop drawings shall be drawn to a scale of not smaller than ¼" = 1'-0".
2. Provide drawings on electronic media in AutoCad .dwg format.
3. Provide layering system separate from wall outline and unique to each discipline.
4. In addition to plan view, provide sections as required to clarify congested situations and verify vertical clearances.
5. Base drawings and building sections in .dwg format will be provided by Architect.

D. HVAC Shop Drawings: Database to begin as HVAC shop drawings, produced by HVAC subcontractor, indicating all ductwork, piping, equipment, and location of mechanical room floor drains and electrical connections to motors. Indicate elevations and sizes of all ductwork piping.
1. Upon completion of HVAC shop drawings, HVAC subcontractor shall transmit electronic database to plumbing subcontractor.

E. Plumbing Shop Drawings: Plumbing subcontractor shall add all plumbing piping, controls and valves, and fixtures to database.
1. Upon completion of Plumbing shop drawings, transmit electronic database to fire protection subcontractor.

F. Fire Protection Shop Drawings: Fire Protection subcontractor shall add all fire protection equipment, piping, sprinkler heads and other elements to database.

1. Upon completion of Fire Protection shop drawings, transmit electronic database to Electrical subcontractor.

G. Electrical Shop Drawings: Electrical subcontractor shall add all electrical fixtures, conduit, and equipment.
1. Upon completion of Electrical shop drawings, transmit electrical database to General Contractor for final coordination.

H. General Contractor's Final Coordination: General Contractor shall thoroughly review shop drawings, adding additional building elements where appropriate, and shall resolve conflicts, coordinating with the Architect, and the various subcontractors.

I. Submit Coordination Shop Drawings: Upon completion of final coordination, General Contractor shall approve coordination shop drawings and transmit 3 sets of hard copies and electronic files on CD's to Architect.

J. The Architect will not process sheet metal or fire protection shop drawings until such time as the coordination drawings have been sufficiently completed and conflicts resolved. This may be done on a floor-by-floor basis as a minimum.

1.9 QUALITY ASSURANCE

A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
1. Acceptable to, or licensed by, manufacturer.
2. Not less than 3 years' experience with systems.
3. Successfully completed not less than 5 comparable scale projects using systems similar to those for this project.
4. Professional Engineer licensed in the State in which the work occurs.

1.10 SUMMARY OF WORK

A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all fire protection work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

1.11 DRAWING INTERPRETATION AND COORDINATION

A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.

B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.

C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.

D. Where doubt arises as to the meaning of the Drawings and Specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

E. Refer to Architectural Drawings for all dimensions and location of lights, ceiling diffusers and sprinkler heads.

1.12 PROJECT/SITE CONDITIONS

A. Visiting Site: 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.

B. Determine sizes and locations, and inverts of existing and new utilities near site.

C. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit under provisions of Division 1 Sections - "Closeout Procedures" and "Project Record Documents" and the following.

B. Record Drawings:
1. Keep accurate record of corrections, variations, and deviations, including those required by change orders

to the Fire Protection drawings.

2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
3. Record changes daily on a set of prints kept at the job site.
4. Submit prints marked as noted above to Architect for review prior to request for final payment.
5. Marked prints will be returned to Contractor for use in preparing Record Drawings.
6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.

C. 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 piping (mylar sepia reproducibles) and electronic files in AutoCAD.
2. Equipment Submittal Data (2).
3. Equipment operating and maintenance manuals (2).
4. Equipment warranty dates and guarantees (2).
5. List of Owner's Personnel who have received operating and maintenance instructions.

D. Contractor’s Material and Test Certificate for above ground piping.

E. Contractor’s Material and Test Certificate for underground piping.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 21 0452
IDENTIFICATION FOR FIRE PROTECTION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, including color and letter style.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Comply with applicable NFPA codes for label of fire protection.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. In existing buildings or facilities, coordinate pipe, valve and equipment labeling to match existing identification methodology, unless otherwise directed by the Architect.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.
2. Color Coding:

System	Background Color	Letters
Equipment	Red	White

3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.
4. Minimum Letter Size: Minimum ½-inch high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.

F. Minimum Letter Size: Minimum 1/2-inch high for viewing distances up to 72-inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information as indicated elsewhere in the Specifications and on the Drawings.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
   1. Colors: Comply with ASME A13.1, unless otherwise indicated.
   2. Lettering: Use piping system terms indicated on the Drawings. Abbreviate only as necessary for each application length.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to partially cover circumference of pipe on lines 6-inches outside diameter and smaller; Snap on, on lines over 6- inches outside diameter and secure with nylon straps.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on the Drawings and an arrow(s) indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions; or as a separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/4-inches high for 2-1/2-inch and larger pipe outside diameter.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of Fire Protection equipment.

B. Install or permanently fasten labels on starters furnished under this Division.

C. Locate equipment labels where accessible and visible.

3.3 WARNING-SIGNS AND LABELS INSTALLATION

A. Write required message on, and attach warning tags to equipment and other items where required in the specifications or shown on the Drawings.

3.4 PIPE LABEL INSTALLATION

A. Identify piping specified under this Division in accordance with ANSI/ASME A13.1.
   1. Label Fire Protection mains only.

B. Locate pipe labels where piping is exposed, or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows: **(Note: In finished spaces, obtain direction from Architect prior to installing pipe labels.)**
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. Near each change in direction.
   5. At access doors, manholes, and similar access points that permit view of concealed piping.
   6. Near major equipment items and other points of origination and termination.
   7. Spaced at maximum intervals of 20 feet along each run.

C. Pipe Label Color Schedule:

Piping System	Background Color	Letter Color
Fire Protection Mains	Red	White

END OF SECTION

SECTION 21 0453
BASIC FIRE PROTECTION MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of common piping, equipment, materials and installation for Fire Protection systems.

B. This Section includes the following:
1. Piping materials and installation instructions common to most Fire Protection piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Concrete.
5. Grout.
6. Escutcheons.
7. Access doors - Building.
8. Flashing
9. Workmanship.
10. Cutting and patching.
11. Excavation, trenching and backfilling.
12. Piping systems installation - Common Requirements.
13. Equipment installation - Common Requirements.
14. Painting and finishing.
15. Supports and anchorages.
16. Protection and cleaning of equipment and materials.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Product Data: For the following:
1. Mechanical sleeve seals.
2. Escutcheons.
3. Access doors - building.

1.4 INFORMATIONAL SUBMITTALS

A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:
1. Fully dimensioned off column lines with location respective to adjacent walls shown.
2. Sleeve size.
3. Pipe size.
4. Pipe service.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Fire Protection installations.

B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate installation of building access doors for fire protection items requiring access that are concealed behind finished surfaces.

D. Electrical Characteristics for Fire Protection Equipment:
   1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.
   2. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Fire Protection equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.1 PIPE, TUBE AND FITTINGS

A. Refer to individual Division 21 Fire Protection Piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 21 Fire Protection Piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Available Manufacturers:
      a. Calpico, Inc.
      b. Innerlynx, Advance Products & Systems, Inc.
      c. Link-Seal by Thunderline.
      d. Metraflex Co.
      e. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.
5. Provide high temperature and U.L. fire rating at fire rated wall penetrations.

2.4 SLEEVES

A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Firestopping Sealant: See Division 07 Sections "Through-Penetration Firestop Systems" and "Fire Resistive Joint Systems" for firestopping sealant requirements.

D. Stuffing Insulation: Glass fiber type, non-combustible.

2.5 CONCRETE

A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
1. Finish: Polished chrome-plated.

2.8 ACCESS DOORS – BUILDING

A. Manufacturers:
1. Bilco.
2. Milcor.
3. Nystrom.

B. Construction:
1. Door: 14-gauge, cold rolled steel.
2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
3. Hinge: Concealed spring hinge.
4. Latch: Screwdriver cam latch.
5. Finish: Phosphate dipped and prime coated.
6. UL labeled when in fire-rated construction with rating to match construction.
7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.

C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.9 FLASHING

A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.

C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. First class and in accordance with best practice. Work to be orderly, neat, workmanlike in appearance and performed by skilled craftsman.

B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.2 CUTTING AND PATCHING

A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Fire Protection work. Repair and finish to match surrounding.

B. Architect's approval required before cutting any part where strength, or appearance of finished work is involved.

C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.

D. Core drill or saw cut openings in existing masonry construction.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.

B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.

C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 31. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.

D. Refer to Division 21, Fire Protection Piping Sections for specific bedding and backfill requirements.

E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.

F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.4 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Fire Protection Piping Sections specifying piping systems.

B. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas and stairwells.

D. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons where exposed piping penetrates walls, ceilings, and floors in finished spaces.

3.5 SLEEVES

A. Sleeves are not required for core-drilled holes.

1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length so that sleeve extends out ½ inch from both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Use the following sleeve materials:
      a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
      b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: 22 gauge galvanized sheet metal sleeves 1/2 inch larger than pipe or pipe covering.
   4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe and adjacent work with stuffing insulation and caulk air tight.
   5. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
   6. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.

C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
   2. Fill void between pipe and sleeve with urethane foam and water proof around pipe on below grade end.

D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 07 Sections “Through Penetration Firestop Systems” and “Fire Resistive Joint Systems”.

3.6 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Fire Protection Piping Sections specifying piping systems.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

D. Flanged Joints:
   1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
   2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.7 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 PIPE CLEANING

A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.9 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.

E. Install equipment to allow right of way for piping installed at a required slope.

F. 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.

3.10 PAINTING AND FINISHING

A. Except as specified below or noted on the Drawing, requirements for painting of Fire Protection systems, equipment, and components are specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Painting of fire piping:
1. The following piping within boiler and chiller room shall be painted in its entirety under Division 09: Painting. Color codes are listed here for information only.
   a. Fire Protection Piping: Red Metaltex B47R3.
2. Should there be a conflict of colors in existing installations, contact the Architect.

3.11 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing and fire protection materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.12 GROUTING

A. Mix and install grout for Fire Protection equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.13 ACCESS DOORS – BUILDING

A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed equipment, valves, etc.

B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.14 FLASHING

A. Provide flexible flashing and metal counterflashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.

3.15 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

A. Equipment and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.

B. At completion of all work, thoroughly clean exposed materials (pipe, etc.) and equipment and make ready for painting.

END SECTION

SECTION 21 0455
FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, Fittings, Valves for:
   1. Service from the water main to the building.
   2. Wet sprinkler system.

B. System design and installation. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13 latest edition.
   1. Sprinkler Protection:
      a. All office, educational areas, dining areas, corridors: Light hazard, 0.10 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
      b. Kitchen, Mechanical Equipment Rooms, Electric Closets, Elevator Shafts and storage between 100 and 250 sq. ft.: Ordinary Hazard, Group 1, 0.15 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
      c. Retail sales and storage rooms, storage rooms over 250 sq. ft.: Ordinary Hazard Group 2, 0.20 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
      d. The minimum water demand requirements for a sprinkler system shall be determined by adding hose stream allowances to the water demand per the following:
         1) For Light Hazard occupancies, add water allowance of 100 GPM for inside and outside hose stream allowance.
         2) For Ordinary Hazard occupancies, the added water allowance shall be increased to 250 GPM for inside and outside hose streams.
         3) For Extra Hazard occupancies, the added water allowance shall be increased to 500 GPM for inside and outside hose streams.
   2. Hydraulic Calculations: The calculated demand including hose stream requirements shall fall no less than 10 percent below the available supply curve.
   3. Comply with IBC (2015 Edition), NFPA 13 (2013 Edition), NFPA 30, Flammable and Combustible Liquid Code, NFPA 54, National Fuel Gas Code, NFPA 70, National Electric Code, NFPA 72, National Alarm and Signaling Code, and NFPA 101, Life Safety Code (2006 Edition).

1.2 RELATED SECTIONS

A. Section 210451 – General Fire Protection Requirements.

B. Section 210452 – Identification for Fire Protection Piping and Equipment.

C. Section 210453 – Basic Fire Protection Materials and Methods.

1.3 SYSTEM

A. A wet sprinkler system providing coverage for the entire building.

B. Fire service from the city main to the building.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of Division 01, Section “Submittal Procedures” and the following:

B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be furnished under Division 21.
   1. List shall be complete with manufacturer’s names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
   2. Call attention to deviations from specified items as to operation and physical dimensions.
   3. Grooved joint couplings and fittings may be shown on drawings and product submittals, and shall be specifically identified by the manufacturer’s style or series designation.
   4. Performance curves for equipment such as pumps shall be included.
   5. Final equipment orders shall not be placed until submittals have been returned marked “No Exceptions Noted” or “Make Corrections Noted”.
   6. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.

C. Shop Drawings: (Wet Sprinkler)
1. A reflected ceiling plan indicating locations of sprinkler heads, lights, HVAC devices, smoke detectors, exit lights and any additional items attached to ceiling. In lift out ceilings, sprinkler heads are to be centered in ceiling tiles. In hard ceilings, sprinkler heads to follow the general arrangement of the ceiling. After review by the Architect, revise layout as required.
2. Prepare a working pipe shop drawing based on hydraulic calculations. The piping shop drawing shall indicate routing and configuration of piping, size of pipe, piping support, elevation of piping and coordination of piping with ductwork. Shop drawings shall include low point drain downs.
3. Hydraulic calculations are to be prepared utilizing a current water flow test (maximum 90 days old). If current flow test is not available, obtain a current flow test and pay for all fees required.
4. Sprinklers shall be referred to on drawings and other documentation by the manufacturer's model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations are not permitted.
5. If water flow information is not available due to new main extension or other construction which prohibits the availability of flow information at the start of construction, the contractor shall estimate probable flow information based on information available. Once permanent water is available at the site, the Contractor shall perform a flow test, incorporate the information into the calculation and make any modifications to the system as may be required.
6. When allowed by local and state authority having jurisdiction, calculations may be calculated from fire pump or standpipe given current flow data of pump and fire riser is provided. Fire pump and/or standpipe test to be within 1 year. A head replacement plan will not be accepted.
7. When drawings and hydraulic calculations are submitted to the Engineer for review, they shall bear the seals of review and approval of the Architect, General Contractor, the Owners Insurance Underwriter. 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 and bear his/her licensure seal with signature and date.
8. The Contractor shall incorporate all comments for approval by local Fire Marshall's Office and any State of Alabama Reviewing Agency. Contractor shall provide signed, sealed and approved set of plans to Engineer upon approval by state and local authorities.
9. Each system calculations, components and alarming to be on shop drawings. Refer to following sections for Special Hazard Systems.

1.5 SYSTEM INSTALLATION AND INSPECTION

A. Required Inspections:
1. All underground and above ground fire line piping must be inspected by a RMS Fire Inspector prior to being covered or concealed.

B. Fire Stopping:
1. All fire stopping of any and all fire rated assemblies must be inspected and approved by a RMS Fire Inspector prior to the work being concealed.

C. Hydrostatic Testing Requirements:
1. The required hydrostatic testing of the underground and above ground fire line piping must be witnessed and approved by an RMS Safety Fire Inspector prior to being covered or concealed.

D. Underground Fire Line Pipe Flush Test Requirements:
1. The required flush test of the underground fire line piping must be witnessed by an RMS Fire Inspector prior to being connected to the above ground piping or riser.

E. Acceptance Inspections & Testing:
1. Allow fire protection and life safety systems installation and acceptance test must be inspected, test, witnessed and approved by an RMS Fire Inspector before the system can be accepted by the University.

F. Plans Review & Approval:
1. All fire protection and life safety system drawings and specifications must be reviewed by this office to ensure code compliance prior to start of any work.

G. RMS Inspection Schedule Notification:

1. Provide a minimum one week notice of all inspections to the University Fire Safety Manager (334)703-7504 to ensure that a Risk Management and Safety (RMS) Fire Inspector is available to perform the required inspections.
2. Provide a minimum one week notice of inspection floor by floor and fire pump testing inspection of Engineer.

H. Provide pad locks and chained systems on sprinkler control (wet and dry) valves.

1.6 REGULATORY REQUIREMENTS

A. Materials: Conform to UL and FM Global Requirements and Standards.

B. Sprinkler System: Conform to NFPA 13, State of Alabama Fire Marshall Requirements, City of Rainbow CIty Fire and Rescue Requirements and Alabama State Building Commission Requirements.

C. Private Service Mains: Conform to NFPA 24.

D. NFPA 25, Inspections, Testing and Maintenance of Water-Based Fire Protection Systems.

E. NFPA 72, Standard for the Installation, Maintenance and Use of Protective Signaling Systems.

F. NFPA 72E, Standard on Automatic Fire Detectors.

G. Applicable Building Codes.

H. Welding Materials and Procedures: Conform to ASME Code.

I. Valves: Bear UL, FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

J. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.7 EXTRA MATERIALS

A. Provide extra sprinklers under provisions of NFPA 13, State and Local requirements.

B. Provide suitable wrenches for each sprinkler type.

C. Provide metal storage cabinet in location designated. (Designate location).

PART 2 - PRODUCTS

2.1 PIPING BELOW GRADE AND BELOW SLAB ON GRADE

A. Ductile Iron: Cement lined ANSI A-21.50.

B. Joints on Ductile Iron: Standard mechanical joint ANSI A-21.11. Provide with retainer glands at all fittings and thrust blocks minimum 1 cubic yard of concrete at all changes of direction.

2.2 ABOVE GROUND PIPING

A. Black Steel Pipe:
1. All piping 1-1/2" and smaller, all piping larger than 1-1/2" with cut grooves or threaded and all welded piping, Schedule 40 black steel ASTM A53, ASTM A795, ASTM A135.
2. Piping larger than 1-1/2" for roll grooving only, Schedule 10 ASTM A795, ASTM B36.10. Schedule 10 pipe may not be used for threading or cut grooving.
3. Cast iron threaded fittings ANSI B16.4 cast iron flanges and flanged fittings ANSI B16.1.
4. Malleable iron threaded fittings, ANSI B16.3.
5. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, ASTM A449 electroplated steel bolts, nuts and washers.
   a. Rigid Type: Coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue-and-recess type couplings, or any coupling that requires exact gapping of bolt pads at required torque ratings, are not permitted.
      1) Victaulic Style 009N-EZ Installation-Ready
      2) Victaulic Style 07 "Zero-Flex" or Victaulic Style 005
   b. Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for the elimination of flexible connectors. Victaulic Style 75.
6. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement into pipe.

B. Malleable Iron Fittings 175 lb. (250 lb.); ASME B16.3, threaded fittings.

2.3 WET SPRINKLER SYSTEM

A. Wet System - Above Ground Piping:
1. Black Steel Pipe:
a. All piping 1-1/2" and smaller, all piping larger than 1-1/2" with cut grooves on threaded and all welded piping, Schedule 40 black steel ASTM A53, ASTM A795, ASTM A135.
b. Piping larger than 1-1/2" for roll grooving only, Schedule 10 ASTM A795, ASTM B36.10. Schedule 10 pipe may not be used for threading or cut grooving.
c. Cast iron threaded fittings ANSI B16.4 cast iron flanges and flanged fittings ANSI B16.1.
d. Malleable iron threaded fittings, ANSI B16.3.
e. Mechanical Grooved Couplings: Ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, ASTM A449 electroplated steel bolts, nuts and washers.
1) Rigid Type: Coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue-and-recess type couplings, or any coupling that requires exact gapping of bolt pads at required torque ratings, are not permitted.
a) Victaulic Style 009N-EZ Installation-Ready.
b) Victaulic Style 07 "Zero-Flex" or Victaulic Style 005.
2) Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for the elimination of flexible connectors. Victaulic Style 75.
f. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement into pipe.
g. Malleable Iron Fittings 175 lb. (250 lb.); ASME B16.3, threaded fittings.

B. Sprinklers - Wet System:
1. Sprinklers to be UL approved glass bulb quick response type.
2. Suspended Ceiling (Lay-in):
a. Manufactures:
1) Viking Model M.
2) Victaulic V27/V34.
b. Type: Quick response recessed pendant type with matching escutcheon plate. Provide color chart to Architect for color selection.
c. Finish: Chrome plated, unless indicated otherwise.
d. Escutcheon Plate Finish: Chrome plated.
e. Fusible Link: Glass bulb type temperature rated for specific area hazard.
3. Suspended Ceiling (Gypsum):
a. Manufactures:
1) Viking Model M.
2) Victaulic Model V38 / V39.
b. Type: Quick response concealed pendant type with painted cover plate.
c. Cover Plate: White. Unless indicated otherwise. Provide color chart to Architect for color selection.
d. Finish: Sprinkler Head – chrome plated.
e. Fusible Link: Glass bulb type temperature rated for specific area hazard.
4. Exposed Area Type:
a. Manufactures:
1) Viking Model M.
2) Victaulic Model V27/V34.
3) Tyco, Reliable, Victaulic.
b. Type: Quick response upright type with guard.
c. Finish: Brass or chrome plated.
d. Fusible Link: Glass bulb type temperature rated for specific area hazard.
e. Guards: Finish to match sprinkler finish.
5. Sidewall Type:

a. Manufactures:
1) Viking Model M.
2) Victaulic Model V27/V34.
3) Tyco, Reliable, Victaulic.
b. Type: Quick response recessed sidewall type.
c. Finish: Chrome plated.
d. Escutcheon Plate Finish: Chrome plated in color.
e. Fusible Link: Glass bulb type temperature rated for specific area hazard.

6. Dry Sidewall Sprinklers (all areas subject to temperature below 40 deg F.):
a. Manufactures:
1) Viking Model M.
2) Victaulic Model V36.
3) Tyco, Reliable, Victaulic.
b. Type: Quick response recessed sidewall type with matching push on escutcheon plate.
c. Escutcheon Plate Finish: Chrome plated.
d. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Pipe Hangers and Supports:
1. Conform to NFPA 13.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Plate Support: Carbon steel ring, adjustable, copper plated.
10. All hangers to be a maximum of 12 inches from all 90 deg ells, the end of a branch line and mains, or an arm-over for drop.

D. Sprinkler Fitting System (Stainless Steel):
1. Manufacturers:
a. Victaulic VicFlex™ (FM-1637; UL 2443)
1) In lieu of rigid pipe offsets or return bends for sprinkler drops, the Victaulic VicFlex™ Multiple-Use Flexible Stainless Steel Sprinkler Drop System may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel 1” NPT Male threaded nipple for connection to branch-line piping, and zinc plated steel reducer with a 1/2" or 3/4" NPT female thread for connection to the sprinkler head.
2) The drop shall include a UL approved Series AH2 braided hose with a bend radius to 2” to allow for proper installation in confined spaces. The hose shall be listed for (4) bends at 31” length, (5) bends at 36” length, (6) bends at 48” length, (6) bends at 60” length or (7) bends at 72” length.
3) All hoses shall be factory-pressure tested to 400 psi.
4) Refer to the Victaulic I-VICFLEX installation manual and the Victaulic VicFlex™ Design Guide, as shown in product submittal 10.85 to ensure proper installation.
b. FlexHead Industries is an approved substitute manufacturer.

E. Gate Valves:
1. Up to and including 2 Inches:
a. Manufactures:
1) Nibco Model T-104-O.
2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
b. Bronze body, bronze trim 175 psi WP, UL Listed, rising stem, handwheel, solid wedge or disc, threaded ends.
2. Over 2 Inches:

a. Manufactures:
   1) Nibco Model F-607-OTS.
   2) Victaulic Model 771.
   3) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
b. Iron body, bronze trim 175 psi WP, UL Listed, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

F. Butterfly Valves:
1. Cast or Ductile Iron Body
   a. Manufactures:
      1) Nibco Model GD-4765-4/8.
      2) Victaulic Series 705.
      3) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
2. Cast or ductile iron, chrome or electroless-nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM pressure responsive seat, lug, or grooved ends, and stainless steel stem. (Stem shall be offset from the disc centerline to provided complete 360-degree circumferential seating.) Valve shall have an extended neck, handwheel and weatherproof actuator housing with gear drive and integral indicating device, and internal tamper switch rated, UL / FM approved.

G. Alarm Check Valve:

1. Victaulic Series 751 grooved end valve or Viking Model J-1 flanged valve complete with retard chamber, drains, gages, by-passes and all accessories required to prevent accidental alarms due to fluctuations in system pressure and testing of the valve while in service. Provide both mechanical and electrical means for actuation of Fire Alarm. Pipe all drains full size to AHJ's preferred location. The alarm check valve's internal components shall be replaceable without removing the valve from the installed position.

H. Check Valves:
1. Up to and including 2-1/2 inches to 8 inches:
   a. Manufacturers:
      1) Nibco Model G-917-W.
      2) Victaulic Series 717.
      3) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
   b. Iron body and swing disc, bronze seat, stainless steel spring, grooved ends, 250 psi WP; suitable for vertical or horizontal installation.

I. Water Motor Alarm:
1. Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer. Victaulic Series 760.

J. Water Flow Switch:
1. System sensor.

K. Supervisory Switches:
1. System sensor.

L. Test and Drain Assembly:
1. Victaulic TestMaster II Style 720 or Viking Model A-1 complete with sight glass and ½" orifice for test purpose. Pipe discharge to drain riser on to exterior and spill on splash block.

2.4 FIRE STOP SYSTEMS

A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. listed assembly compatible with the rating of the wall or floor being penetrated.

B. Non-rated walls – sheet rock joint compound may be used to seal opening.

C. For piping passing through listed sheet rock walls or partitions:
1. Uninsulated pipe passing through 2 hour walls or partitions – minimum 5/8" depth of Hilti FS 605 filling annular space between wall and pipe on both sides of wall. U.L. Listing #WL1056.
2. Uninsulated pipe passing through 2 hour walls or partitions – minimum 1-1/4" depth of Hilti FS 601 filling annular space between pipe and wall on both sides of wall, U.L. Listing #WL1054.

D. For piping passing through concrete floors, concrete walls or concrete block walls.

1. Uninsulated Schedule 40 steel pipe; fill annular space between pipe and opening with Hilti #FS 605. U.L. Listing #CJ1184.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install piping in accordance with NFPA 13 for sprinkler systems and NFPA 24 for service mains.

B. Connect to site fire service installed under another section. Verify the site with civil drawings for the exact size and location of the service prior to beginning work.

C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

D. Grooved joint shall be installed in accordance with the manufacturer's written recommendations. Grooved ends shall be clean and free from indentations, projections, or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)

E. Install piping to conserve building space, to not interfere with use of space and other work.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers form reinforcement concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

I. Pipe Hanger and Supports:
1. Install in accordance with NFPA 13 and NFPA 14.
2. Hangers on branch lines to comply with NFPA 13, 9.2.3.
3. Hangers on mains to comply with NFPA 13, 9.2.4.
4. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for a drop.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple trapeze hangers may be used.
7. Provide copper plated hangers and supports for copper piping.
8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

J. Slope piping and arrange systems to drain at low points.

K. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coast of zinc rich primer to welding.

L. Do not penetrate building structural members unless indicated.

M. Provide sleeves when penetrating floors and wall. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

O. Die cut threaded joints with full cut standard taper pipe threads and connect with Teflon tape or Teflon pipe compound applied to male threads.

P. Install valves with stems upright or horizontal, not inverted.

Q. Provide valves for shut-off or isolating service and where shown on plans.

R. Provide drain valves at main shut-off valves, low points of piping and apparatus.

S. Provide automatic sprinkler coverage at the bottom of hydraulic elevator shafts and elevator machine room in Accordance with NFPA 13 and local requirements.

T. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

U. Sprinkler bulb protectors shall be removed by hand. Do not use tools or devices that could damage the bulb.

END OF SECTION

SECTION 22 0401
GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general plumbing requirements. Applies to all Division 220400 sections.

1.2 DEFINITIONS

A. "Provide" means to furnish and install, complete and ready for operation.

1.3 REFERENCES

A. AGA: American Gas Association.

B. ANSI: American National Standards Institute, Inc.

C. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.

D. ASME: American Society for Mechanical Engineers.

E. ASSE: American Society of Sanitary Engineers.

F. ASTM: American Society of Testing and Materials.

G. AWWA: American Water Works Association.

H. CISPI: Cast Iron Soil Pipe Institute.

I. FM: Factory Mutual.

J. NAIMA: North American Insulation Manufacturers Association.

K. NEMA: National Electrical Manufacturers Association.

L. NFPA: National Fire Protection Association.

M. NSF: National Sanitation Foundation.

N. MSS: Manufacturers Standardized Society of the Valve and Fittings Industry.

O. PDI: Plumbing and Drainage Institute.

P. UL: Underwriters Laboratories, Inc.

1.4 REGULATORY REQUIREMENTS

A. Comply with current edition, unless otherwise noted, of the following codes and standards:
1. ASME B31.9 – Building Services Piping.
2. ADA – American's with Disabilities Act.
3. ASME – Boiler and Pressure Code.
4. NFPA 30 – Flammable and Combustible Liquids Code.
5. NFPA 54 – National Fuel Gas Code.
6. NFPA 70 – National Electrical Code.
7. NFPA 101 – Life Safety Code.
8. IBC – International Building Code with Fire, Mechanical, Plumbing, and Gas Codes; 2015 Edition.
9. Alabama Boiler and Pressure Vessel Code.
10. Local Health Department.

B. Permits, Licenses, Inspections and Fees:
1. Obtain and pay all permits, licenses, inspections and fees, and comply with all rules, laws and ordinances pertaining to the Contractor's portion of the Work.
2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.5 PRODUCT REQUIREMENTS

A. Provide new standard, materials throughout.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Substitutions:
1. Comply with the provisions of Division 01, Section "Product Requirements" and the following.

2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor's bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor's proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.
3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
4. The basis of design manufacturer's equipment and scheduled Plumbing equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
    a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
    b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.
    c. Prior to approval of submittals of plumbing equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
    d. If minimum energy ratings or efficiencies are specified, equipment shall comply with specified requirements.
5. Each Bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:
    a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
    b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
    c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.
6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.6 SUBMITTALS

A. Submit under provisions of Division 01, Section "Submittal Procedures" and the following.

B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 220400 Sections of Division 22.
1. List shall be complete with manufacturer names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
2. Call attention to deviations from specified items as to operation and physical dimensions.
3. Include performance curves for pumps.
4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted."
5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project Close-Out Documents.

C. Shop Drawings: Before starting work, submit and obtain approval from Architect of detailed drawings of the following, fully dimensional (including elevations of ductwork and piping) and drawn to 1/4" to 1'-0" scale.

Submit electronic file of each drawing in PDF format. Engineer will return electronic copy of marked-up drawings. Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation.

1. For multi-story buildings, submit detailed floor penetration sleeve layout drawings. See Division 22, Section "Plumbing Basic Materials and Methods," Article "Informational Submittals."

1.7 COORDINATION DRAWINGS

A. General:
   1. Within 60 days of Notice to Proceed, provide Coordination Drawings for the following areas of the building:
      a.
   2. Do not base Coordination Drawings on reproduction of Contract Documents or standard printed data.
   3. Submitted Coordination Drawings are for information only and typically will not be returned to the Contractor. Architect will not take any action, but may define coordination conflicts or problems and inform the Contractor of such conflicts or problems.

B. Content:
   1. Project specific information, drawn accurately to scale.
   2. Show sequencing and spatial relationship of separate units of work that must function in a restricted manner to fit in the space provided, or function as indicated.
   3. Indicate dimensions shown on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

C. Format:
   1. Coordination shop drawings shall be drawn to a scale of not smaller than 1/4" = 1'-0".
   2. Provide drawings on electronic media in AutoCAD (.dwg) format.
   3. Provide layering system separate from wall outline and unique to each discipline.
   4. In addition to plan view, provide sections as required to clarify congested situations and verify vertical clearances.
   5. Base drawing and building sections in .dwg format will be provided by Architect.

D. HVAC Shop Drawings: Database to begin as HVAC shop drawings, produced by HVAC subcontractor, indicating all ductwork, piping, equipment, and location of mechanical room floor drains and electrical connections to motors. Indicate elevations and sizes of all ductowork piping.
   1. Upon completion of HVAC shop drawings, HVAC subcontractor shall transmit electronic database to plumbing subcontractor.

E. Plumbing Shop Drawings: Plumbing subcontractor shall add all plumbing piping, controls and valves, and fixtures to database:
   1. Upon completion of Plumbing shop drawings, transmit electronic database to fire protection subcontractor.

F. Fire Protection Shop Drawings: Fire Protection subcontractor shall add all fire protection equipment, piping, sprinkler heads and other elements to database.
   1. Upon completion of Fire Protection shop drawings, transmit electronic database to Electrical subcontractor.

G. Electrical Shop Drawings: Electrical subcontractor shall add all electrical fixtures, conduit, and equipment.
   1. Upon completion of Electrical shop drawings, transmit electrical database to General Contractor for final coordination.

H. General Contractor's Final Coordination: General Contractor shall thoroughly review shop drawings, adding additional building elements where appropriate, and shall resolve conflicts, coordinating with the Architect, and the various subcontractors.

I. Submit Coordination Shop Drawings: Upon completion of final coordination, General Contractor shall approve coordination shop drawings and transmit 3 sets of hard copies and electronic files on CD's to Architect.

J. The Architect will not process sheet metal or fire protection shop drawings until such time as the coordination drawings have been sufficiently completed and conflicts resolved. This may be done on a floor-by-floor basis as a minimum.

1.8 QUALITY ASSURANCE

A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
   1. Acceptable to, or licensed by, manufacturer.
   2. Not less than 3 years experience with systems.
   3. Successfully completed no less than 5 comparable scale projects using systems similar to these for this project.
   4. Current Master Plumbing's Certificate and Master's Gas Certificate issued by the State, County, and City in which the work occurs.

1.9 SUMMARY OF WORK

A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all plumbing work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

B. Equipment Furnished by Others:
   1. Connect to all equipment shown on plumbing drawings that require plumbing connections.
   2. Provide piping, shut-off valves, and unions required for a complete installation.
   3. Equipment furnished by others include:
      a. Casework.
      b. Ice machines.
      c. Coffee makers.
      d. Refrigerators

1.10 DRAWING INTERPRETATION AND COORDINATION

A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.

B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.

C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation, and best appearance.

D. Where doubt arises as to the meaning of the drawings and specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

E. Refer to Architectural Drawings for all dimensions.

1.11 PROJECT / SITE CONDITIONS

A. Visiting Site: 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.

B. Determine sizes, locations, and inverts of existing and new utilities near site.

C. Cause as little interference or interruption of existing utilities and service as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit under provisions of Division 01, Sections "Closeout Procedures" and "Project Record Documents" and the following.

B. Record Drawings:
   1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Plumbing drawings.
   2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
   3. Record changes daily on a set of prints kept at the job site.

4. Submit prints marked as noted above to Architect for review prior to request for final payment.
5. Marked prints will be returned to Contractor for use in preparing Record Drawings.
6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.

C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. Record drawings – plumbing piping (PDF reproducibles) and electronic files in AutoCAD.
2. Equipment Submittal Data (2).
3. Equipment operating and maintenance manuals (2).
4. Equipment warranty dates and guarantees (2).
5. Pressure vessel certificates (2).
6. Certificate of Disinfection of domestic water lines.
7. List of Owner's Personnel who have received operating and maintenance instructions.
8. Submit factory start-up/field reports for:
   a. Domestic water heaters.
   b. Domestic hot water recirculating pumps

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 22 0403
BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of common piping, equipment, materials and installation for Plumbing systems.

B. This Section includes the following:
1. Piping materials and installation instructions common to most Plumbing piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Concrete.
7. Grout.
8. Escutcheons.
9. Access doors - Building.
10. Flashing
11. Workmanship.
12. Cutting and patching.
13. Excavation, trenching and backfilling.
14. Piping systems installation - Common Requirements.
15. Equipment installation - Common Requirements.
16. Painting and finishing.
17. Concrete bases.
18. Supports and anchorages.
19. Protection and cleaning of equipment and materials.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:
1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.

4. Escutcheons.
5. Access doors - building.

1.4 INFORMATIONAL SUBMITTALS

A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:
   1. Fully dimensioned off column lines with location respective to adjacent walls shown.
   2. Sleeve size.
   3. Pipe size and insulation thickness.
   4. Pipe service.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate installation of building access doors for Plumbing items requiring access that are concealed behind finished surfaces.

D. Electrical Characteristics for Plumbing Equipment:
   1. Coordinate electrical system installation to match requirements of equipment furnished on this project.
   2. If minimum energy ratings or efficiencies are specified, equipment shall comply with these requirements.
   3. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Plumbing equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

2.2 PIPE, TUBE AND FITTINGS

A. Refer to individual Division 22 Plumbing Piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 Plumbing Piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:
1. For pipe sizes NPS 2 and smaller: PVC or CPVC, Schedule 80, one-piece fitting; one end with threaded brass insert, and one solvent-cement socket or threaded end.
2. For pipe sizes larger than NPS 2: Flanged joints.

B. Fitting-Type Transition Couplings:
1. Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. Dielectric Nipples:
1. Manufacturers:
   a. Perfection Corp.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Victaulic Co. of America; Clearflow Dielectric Waterway Style 47.
2. Zinc electroplated steel nipple with inert and noncorrosive, thermoplastic lining; treaded ends; and 300 psig minimum working pressure at 230 deg F. Ring-groove to lock liner to steel casing and provide indentifying roll marking.

B. Dielectric Flanges:
1. Manufacturers:
   a. Capital Manufacturing.
   b. Central Plastics.
   c. Watts.
   d. Wilkins, a Zurn Company.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. End Connections: Solder-joint or thread copper alloy and thread ferrous.
5. Dielectric Flange Insulating Kits:
   a. Non-conducting materials for field assembly or companion flanges.
   b. Gasket: Neoprene or phenolic.
   c. Bolt Sleeves: Phenolic or polyethylene.
   d. Washers: Phenolic with steel backing washers.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Available Manufacturers:
   a. Calpico, Inc.
   b. Innerlynx, Advance Products & Systems, Inc.
   c. Link-Seal by Thunderline.
   d. Metraflex Co.
   e. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.
5. Provide high temperature and U.L. fire rating at fire rated wall penetrations.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Firestopping Sealant: See Division 07 Sections "Through-Penetration Firestop Systems" and "Fire Resistive Joint Systems" for firestopping sealant requirements.

D. Stuffing Insulation: Glass fiber type, non-combustible.

2.8 CONCRETE

A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.10 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
1. Finish: Polished chrome-plated.

2.11 ACCESS DOORS – BUILDING

A. Manufacturers:
1. Bilco.
2. Milcor.
3. Nystrom.

B. Construction:
1. Door: 14-gauge, cold rolled steel.
2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
3. Hinge: Concealed spring hinge.
4. Latch: Screwdriver cam latch.
5. Finish: Phosphate dipped and prime coated.
6. UL labeled when in fire-rated construction with rating to match construction.
7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.

C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.12 FLASHING

A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.

C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

D. Shower Pans: Specified in Division 09, Section "Ceramic Tile."

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. First class and in accordance with best practice. Work to be orderly, neat, workmanlike in appearance and performed by skilled craftsman.

B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.2 CUTTING AND PATCHING

A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Plumbing work. Repair and finish to match surrounding.

B. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.
   1. See Part 1 – 1.4 Informational Submittals above.

D. Core drill or saw cut openings in existing masonry construction.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.

B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.

C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 31. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.

D. Refer to Division 22, Plumbing Piping Sections for specific bedding and backfill requirements.
   1. For factory or field insulation or coated piping, the bedding shall be a minimum of 6 inches of sand. The first 12 inches of backfill above the pipe shall be sand.

E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.

F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.4 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Plumbing Sections specifying piping systems.

B. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons where exposed, non-insulated piping penetrates walls, ceilings, and floors in finished spaces.

M. Connections to compressed air mains shall be made to the top of the main.

3.5 SLEEVES

A. Sleeves are not required for core-drilled holes, or wall hydrants.
   1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length so that sleeve extends out ½ inch from both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Use the following sleeve materials:
   a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
   b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.
4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.
5. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
6. Provide for continuous insulation wrapping thru sleeve.
7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.

C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 07 Sections “Through Penetration Firestop Systems” and “Fire Resistive Joint Systems”.

E. Cast in Place Sleeving System Installation:
   1. General: Install penetration firestopping to comply with manufacturer’s published installation instructions and drawings for products and applications indicated.
   2. Install forming materials and other accessories of types required to support fill materials during application in the position needed to produce cross-sectional shapes and depths required for the fire ratings required:
      a. After installing fill materials and allowing them to fully cure, remove combustible forming materials and accessories not indicated as permanent components of firestopping.

3.6 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Plumbing Piping Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

G. Flanged Joints:
   1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.

2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

I. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

J. Composite automatic couplers:
1. Composite automatic couplers shall be installed in accordance with manufacturers installation instructions.

3.7 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric fittings to connect piping materials of dissimilar metals.

3.8 PIPE CLEANING

A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.9 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.

E. Install equipment to allow right of way for piping installed at a required slope.

F. 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.

G. All back-to-back floor mounted water closets shall be connected via a double combination wye and 1/8 bend. Sanitary crosses are **NOT** acceptable.

3.10 PAINTING AND FINISHING

A. Except as specified below or noted on the Drawing, requirements for painting of Plumbing systems, equipment, and components are specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Paint water pipe and insulation downstream of backflow preventor (non-potable water) to termination point, or to connection with mechanical system piping, purple.

3.11 CONCRETE BASES

A. Provide concrete foundations with nominal dimensions conforming to the following schedule for floor-mounted equipment:

Equipment	Foundation

Domestic water heaters	4” high pad
Equipment and piping stands and supports	4” high pad

B. Concrete bases shall be continuous and shall have beveled edges and smooth float finish. Concrete bases shall be reinforced with No. 3 bars a maximum of 12” on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.

C. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.

D. Concrete pads shall extend a minimum of 4” beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.

E. Equipment attached directly to foundations or inertia bases; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation.

F. Fill voids between baseplates and foundations, and level equipment, with grout.

3.12 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.13 GROUTING

A. Mix and install grout for Plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.14 ACCESS DOORS – BUILDING

A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.

B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.15 FLASHING

A. Provide flexible flashing and metal counterflashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.

B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

C. Flashing for vent and soil pipes through the roof and roof drains specified under Division 07.

D. Flashing floor drains and floor sinks in floors with topping over finished area with lead, 10-inches clearance sides with minimum 36x36 inch sheet size. Fasten flashing to drain clamp device.

E. Seal floor and shower drains water tight to adjacent materials.

3.16 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

A. Equipment, fixtures, and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.

B. At completion of all work, thoroughly clean, exposed materials (pipe, etc.), equipment, and fixtures and make ready for painting.

END SECTION

SECTION 22 0405
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, including color and letter style.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping, unless otherwise noted herein.

B. NFPA 99 Compliance: Comply with NFPA 99 for labeling of medical gases, cylinder storage and equipment.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. In existing buildings or facilities, coordinate pipe, valve and equipment labeling to match existing identification methodology, unless otherwise directed by the Architect.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.
2. Color Coding:

System	Background Color	Letters
Equipment served by emergency power	Red	White
Other equipment	Black	White

3. Temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.
5. Minimum Letter Size: Minimum ½-inch high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.

F. Minimum Letter Size: Minimum 1/2-inch high for viewing distances up to 72-inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information as indicated elsewhere in the Specifications and on the Drawings.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated on the Drawings. Abbreviate only as necessary for each application length.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to partially cover circumference of pipe on lines 6-inches outside diameter, including insulation, and smaller; Snap on, on lines over 6-inches outside diameter, including insulation, and secure with nylon straps.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on the Drawings and an arrow(s) indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions; or as a separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/4-inches high for 2-1/2-inch and larger pipe outside diameter, including insulation.

D. Following existing labeling color and format in existing buildings, unless otherwise directed by the Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of Plumbing equipment.

B. Install or permanently fasten labels on starters furnished under this Division.

C. Locate equipment labels where accessible and visible.

3.3 WARNING-SIGNS AND LABELS INSTALLATION

A. Write required message on, and attach warning tags to equipment and other items where required in the specifications or shown on the Drawings.

B. Provide warning signs at gas storage cylinders per the requirement of NFPA 99.

3.4 PIPE LABEL INSTALLATION

A. Identify piping specified under this Division in accordance with ANSI/ASME A13.1.

B. Locate pipe labels where piping is exposed, or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows: **(Note: In finished spaces, obtain direction from Architect prior to installing pipe labels.)**
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near each change in direction.
5. At access doors, manholes, and similar access points that permit view of concealed piping.
6. Near major equipment items and other points of origination and termination.
7. Spaced at maximum intervals of 20 feet along each run.

C. Pipe Label Color Schedule:

Piping System	Background Color	Letter Color
Domestic Cold-Water	Green	White
Domestic Hot-Water Piping	Green	White
Domestic Hot-Water Return Piping	Green	White
Natural Gas	Yellow	Black
Soil	Green	White
Waste	Green	White
Vent	Green	White
Storm	Green	White

D. Heat Traced Pipes: Apply "Electric Traced" signs to outside of thermal insulation jacket.

END OF SECTION

SECTION 22 0407
PLUMBING SYSTEMS INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and Accessories.

C. Equipment Insulation.

D. Covering.

1.2 RELATED SECTIONS

A. Division 07 – Firestopping.

B. Division 22 – Section 220405 “Identification for Plumbing Piping and Equipment.”

C. Division 22 – Section 220410 “Plumbing Piping”: Placement of hangers and hanger inserts.

1.3 SUBMITTALS FOR REVIEW

A. Section 220401: Procedures for submittals.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing insulation work with minimum 3 years’ experience.

1.5 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 or UL 723.

B. All insulation materials, adhesives, mastic and coating shall be asbestos free.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufactures for Fiberglass Insulation Materials:
1. Owens-Corning.
2. Certainteed.
3. Knauf.
4. Johns Manville Corporation

B. Acceptable Manufacturers for Adhesives, Mastics and Coatings:
1. Armstrong.
2. Benjamin Foster.
3. Childers.
4. Marathon.

C. Acceptable Manufacturers for Metal Jackets:
1. Childers.
2. Manville Metal-Loc.

2.2 GLASS FIBER PIPE INSULATION

A. Manufacturer: Owens-Corning Model SSL-11.

B. Insulation: ASTM C547; rigid molded, noncombustible.
1. ‘K’ value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:
1. White kraft paper with glass fiber yarn, bonded to aluminized film.

2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

D. Tie Wire: 0.048-inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

F. Insulating Cement/Mastic:
1. ASTM C195; hydraulic setting on mineral wool.

2.3 JACKETS – PIPING AND EQUIPMENT

A. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E84.

B. PVC Jacket.
1. Jacket: ASTM D1784, one piece molded type fitting covers and sheet material, off-white color.
a. Minimum service temperature: 0 degrees F.
b. Maximum service temperature: 150 degrees F.
c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
d. Thickness: 20 mil.
e. Connections: Brush on welding adhesive.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and jacketed outdoor use on below ambient services.
1. Products:
a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H.B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping and equipment have been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Fit pipe hangers over insulation.

E. Inserts and Shields:
1. Application: Protect insulated piping at hangers and supports with insulation shield. On pipe sizes over 2 inches, provide insert.
2. Insulation Protection Shield: Galvanized steel formed in half circle to fit insulation. Length and gauge as follows:
a. Up to NPS 4: 12 inches long and 22 gauge.
b. NPS 6: 18 inches long and 22 gauge.

c. NPS 8 through 12: 24 inches long and 18 gauge.
d. NPS 14 and Large: 24 inches long and 16 gauge.

3. Insulation-Insert Material: Water repellent treated, ASTM C533, Type I calcium silicate; or ASTM C552, Type II cellular glass of same thickness and vapor barrier jacket specified for surrounding insulation. Insert shall be a minimum of 2 inches longer than the shield.
4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
5. For Clevis Hangers: Insert shall cover lower 180 degrees of pipe.
6. Option: At Contractor's option, insert may be factory fabricated Thermal Hanger Shield (insulation insert encased in sheet metal shield) equal to Pipe Shield, Inc. "Insulated Pipe Supports."
7. Option: At Contractor's option, steel pipe saddles may be used on hot water pipe in lieu of insert and shield. Fill interior void of saddle with insulation that matches adjoining insulation.

F. Continue insulation through metal studs, walls, sleeves, pipe hangers, and other pipe penetrations. Finish firestopping at supports, protrusions, and interruptions. At fire separations, refer to Division 07 and Section 220410: Sleeves.

G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 GLASS FIBER PIPE INSULATION APPLICATION

A. Provide vapor barrier jackets, factory or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding stapes 4 inch on center and vapor barrier mastic.

B. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

C. **Finish fittings exposed in equipment rooms, boiler rooms and in finished spaces with vinyl acrylic mastic over glass fab**.

D. For hot piping do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

3.4 JACKETS - PIPING

A. Aluminum Jacket:
1. Rivet jacketing in place and band with aluminum bands 18 inches on center.
2. Finish fittings on aluminum jacketed lines with vinyl acrylic mastic reinforced with glass fab. Provide preformed aluminum insulation covers for outdoor fittings.
3. For exterior applications, locate jacket seams on bottom side of horizontal pipes.

3.5 SCHEDULES - PIPING

A. Plumbing Piping:
1. Domestic Cold Water Interior, Above Grade:
   a. Glass Fiber Pipe Insulation
      1) All pipe sizes: 1 inch thick.
      2) Pipes located in walls: ½ inch thick.
2. Domestic Hot and Recirculating Water Interior, Above Grade:
   a. Glass Fiber Pipe Insulation
      1) All pipe sizes: 1 inch thick.
      2) Pipe located in walls: ½ inch thick.
3. Roof Drain Bodies and Horizontal Storm Piping, Above Grade:
   a. Glass Fiber Pipe Insulation
      1) All pipe sizes: 1 inch thick.
      2) Insulation not required on emergency roof overflow drains and piping.
4. Floor Drain Bodies, Traps and Waste Piping Between Floor Drain and Waste Stack for Floor Drains Serving Refrigeration Equipment, Ice Machine and AC Units; Interior, Above Grade:
   a. Glass Fiber Pipe Insulation
      1) All pipe sizes: 1 inch thick.

3.6 INSTALLATION – EQUIPMENT INSULATION GENERAL

A. Install in accordance with NAIMA Insulation Standards.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires or bands.

E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

G. Finish insulation at supports, protrusions, and interruptions.

H. Equipment in Mechanical Rooms or Finished Spaces: Finish with canvas jacket or as scheduled.

I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

END OF SECTION

SECTION 22 0410
PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves for the following piping systems:
   1. Sanitary, waste and vent piping.
   2. Storm (Rainwater) piping.
   3. Domestic, hot and cold water piping.
   4. Natural gas piping.
   5. Valves and specialties.

1.2 RELATED SECTIONS

A. Section 220401 – General Plumbing Requirements.

B. Section 220403 – Basic Plumbing Materials and Methods.

C. Section 220405 – Identification for Plumbing Piping and Equipment.

D. Section 220407 – Plumbing Systems Insulation.

1.3 SUBMITTALS FOR REVIEW

A. Division 01 – Submittals and Section 220401: Procedures for submittals.

B. Provide product data on the following:
   1. Pipe materials, pipe fittings and accessories.
   2. Manufacturers catalogue data and cut sheets on all fixtures and equipment.
   3. Valve data and ratings.

C. Manufacturer's drawings of listed closing methods to be used to close penetrations through rated assemblies.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the City of Birmingham, Alabama, codes and standards.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 - PRODUCTS

2.1 SANITARY WASTE PIPING, BELOW GRADE OR BELOW SLAB ON GRADE

A. PVC Pipe:
   1. Pipe: Schedule 40, ASTM D2665 and ASTM D1785.
   2. Fittings: PVC with DWV pattern, ASTM D2665.
   3. Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.
   4. Transition to cast iron to be made maximum 6" above finish floor.

2.2 SANITARY WASTE AND VENT PIPING, ABOVE SLAB ON GRADE

A. Waste and vent piping to be cast iron. Waste piping 2 inch and smaller from fixture to trap to be galvanized steel, DWV copper tube or cast iron.

B. Cast Iron Pipe:
   1. Pipe: CISPI 301, hubless, service weight, bituminous coating.
   2. Fittings: Cast iron, bituminous coated.
   3. Joints: CISPI 310, neoprene gaskets and stainless steel clamp and shield assemblies. All standard duty hubless couplings shall meet CISPI 310 and be listed by NSF International.
      a. Approved manufacturers: Husky HD 2000, Mission Heavyweight or Clamp All-80.
      b. Approved manufacturers: Anaco Husky HD 4000, Ideal-Tridon Super Heavy Duty "HD" no-hub couplings, Fernco HD Heady Duty no-hub couplings.

C. Copper DWV Tube:
   1. Pipe: ASTM B306, DWV.
   2. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
   3. Joints: 50-50, ASTM B32, solder, Grade 50B.

D. Steel Pipe:
1. Pipe: ASTM A53, Schedule 40, galvanized.
2. Cast Iron Fittings: ASME B16.4, drainage pattern threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, screwed type.

2.3 STORM WATER PIPING, BELOW GRADE OR BELOW SLAB ON GRADE

A. PVC Pipe:
1. Pipe: Schedule 40, ASTM D2665 and ASTM D1785.
2. Fittings: PVC with DWV pattern, ASTM D2665.
3. Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.

B. Discharge from elevator sump pumps to be PVC.

2.4 STORM WATER PIPING, ABOVE SLAB ON GRADE

A. Cast Iron Pipe:
1. Pipe: CISPI 301, hubless, service weight, bituminous coating.
2. Fittings: Cast iron, bituminous coating.
3. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies. All standard duty hubless couplings shall meet CISPI 310 and be listed by NSF International.
a. Approved manufacturers: Husky HD 2000, Mission Heavyweight or Clamp All-80.

2.5 WATER PIPING, BELOW SLAB ON GRADE OR BELOW GRADE

A. Water piping: Copper tube.

B. Copper Tubing:
1. Pipe: ASTM B88, Type K soft copper.
2. Fittings: ASME B16.22 wrought copper and bronze.
3. Joints: "Sil-Fos".
4. Piping to be installed to minimize the number of joints below grade of or below slab on grade.
5. Encase all below ground copper piping in plastic sleeve or 1/2" unsplit foam insulation.

2.6 WATER PIPING, ABOVE GRADE

A. Water piping: copper tube.

B. Copper Tubing:
1. Pipe: ASTM B88, Type L, hard drawn.
2. Fittings: ASME B16.22, wrought copper and bronze.
3. Joints: ASTM B32, 95-5 solder, Grade 95TA, lead free with lead free flux.

C. Insulation:
1. Insulate all water piping (cold, hot and hot return) above slab on grade with 1" fiberglass insulation. Insulation thickness may be reduced to 1/2 inch walls.
2. Insulation shall be installed continuous through walls.
3. See Section 220407 of the specifications for insulation description.

D. Identification:
1. Identify all piping in accordance with Section 220405 of the specification.

2.7 NATURAL GAS PIPING, BELOW GRADE

A. Steel Pipe:
1. Pipe: ASTM A53 Schedule 40 black mill wrapped with X-Tru Coat.
2. Fittings: Malleable iron threaded ASME B 16.3 with AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
3. Joints: Screwed with Teflon tape applied to male threads only.

B. Plastic Pipe:
1. Pipe: ASTM S-1248 polyethylene for grade P24, Class B (PE 2406).
2. Fittings: Injection molded as described in ASTM-D-2683 and ASTM D-3216 Federal Department of Transportation Title 49 Part 192 minimum safety regulations and API 15 LE for polyethylene lines.
3. Joints: Butt fused in accordance with manufacturers recommendations.

4. Trace all below grade pipeline with single strand #16 yellow insulated copper wire laid directly on top of piping prior to covering pipe extended above grade and wrapped around pipe at each termination point.

2.8 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe:
1. Pipe: ASTM A53 Schedule 40 black.
2. Fittings: ASME B16.3, malleable iron.
3. Joints: NFPA 54, threaded with Teflon tape applied to male threads only.

B. All gas piping in the 2 psi system shall be labeled with plastic labels indicating 2 psi at the beginning of the system, at the end of the system and at intervals not exceeding six feet.

2.9 FLEXIBLE PIPE CONNECTIONS

A. Stainless steel corrugated tubing with stainless steel wire braid.

B. Working pressure 200 psi minimum.

C. End connections 2” and smaller-male pipe threads, larger than 2” flanged.

D. Manufacturers: Minnesota Flexible Corporation, Metaflex, Flexicraft and Hyspan.

2.10 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 2 Inches:
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Dielectric waterway; zinc electroplated steel nipple with thermoplastic liner and threaded ends.

D. Expansion Joints: Fernco No. XJ or approved equal.

2.11 PIPE HANGERS AND SUPPORTS

A. Hangers:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods or Unistrut multiuse channel.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support when applied directly to the copper piping: Copper steel ring, adjustable.
9. Install hanger over insulation on insulated pipe with sheet metal saddle rolled on the ends centered in hanger. See Section 220407.

B. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

C. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

D. Roof Supports:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Erico PP50H6.
2. Hangers for Pipe Sizes 2 Inches and Over: Erico PP50H6.
3. Vertical Support: Steel riser clamp.

E. For fasteners in existing concrete structures, use drilled in expansion anchors with load rating 150% greater than the pipe hanger rating. Note: Powder drive anchors are not acceptable.

F. Beam Clamps: Grinnell Figure #229.

2.12 BALL VALVES (LEAD FREE)

A. Up to and including 4 inches:
   1. Manufacturers:
      a. Jomar JF-100SG / JF-100TG full port.
      b. Nibco, Apollo, Milwaukee, Kitz 868M/869M (3/8”-2”).
   2. MSS-SP-110 Class 125, lead free bronze body, 316 stainless steel full port ball and stem, PTFE seats and seals, blow-out proof stem and threaded ends.

B. Press Fit:
   1. Manufacturers:
      a. Viega.
   2. Full port, stainless steel ball and stem with EPDM sealing elements, press connection.

C. Where called for on plans, provide lockable handle. Lock provided by Owner.

2.13 BUTTERFLY VALVES (LEAD FREE)

A. For pipe sizes 4 inches and larger
   1. Manufacturers
      a. Kitz 6133EL
      b. Nibco, Jomar, Watts, Apollo, Milwaukee
   2. Ductile iron body, lug style, stainless steel disc and stem, 10 position handle, EPDM o-rings
   3. 250 PSI
   4. Conforms to NSF 61, MSS-SP-67

2.14 OUTSIDE WATER MAIN VALVES

A. Manufacturers:
   1. Stockham.
   2. American Darling
   3. Crane.

B. Iron body, bronze trim, 200 psig WP, non-rising stem, double disc, and parallel seat. Provide cast iron or ductile iron access to grade with tee handle wrench.

2.15 REDUCED PRESSURE ZONE BACKFLOW PREVENTER VALVE ASSEMBLIES

A. 1 inch and larger: Equal to lead free Watts #LF909 with ball valves and inlet strainer. Provide additional valve upstream of strainer. Clayton, Wilkins or equal. Provide same size as piping. Must be installed in a horizontal position.

B. 1/2 inch and 3/4 inch: Watts #9D, Wilkins #750, same size as pipe.
   1. Pipe relief port to sanitary receptor or hub drain and terminate with air gap.

C. Pipe relief from backflow preventer full size to nearest floor drain. Provide factory air gap for relief connection.

D. Watts model LF7R dual check valve back flow preventer, lead free copper silicon alloy body, stainless steel springs and EPDM seals. Backflow preventer to match line size.

E. Double check valve assemblies: Watts #LF709, Clayton or Beeco. Provide with indicating valves on fire protection lines. Non-indicating or ball valves may be used on lines other than fire protection.

F. Backflow preventer and double check valve assemblies must be calibrated by a certified tester at the time of installation, prior to completion of project, in order to ascertain that the assembly is in full working order.

2.16 BALANCING VALVES (CIRCUIT SETTER)

A. Manufacturer:
   1. Caleffi 142251A Series, 3/4-inch variable orifice balancing valve.

B. Install on hot water return line at point of connection to hot water return riser on main and where indicated on drawings. Provide ball valve on leaving side of flow indicator.

2.17 SWING CHECK VALVES (LEAD FREE)

A. Up to and Including 3 Inches:
   1. Manufactures:
      a. Nibco Model S-413-Y-LF or T-413-B-LF.

b. Crane, Stockham, Milwaukee, Kitz.

2. MSS SP-80 and MSS SP-139, Class 125, bronze body and cap, bronze trim and seat, threaded ends.

B. Larger than 3”

1. Manufactures:
   a. Nibco Model F-910-LF.
   b. Crane, Stockham, Milwaukee, etc.
2. MSS SP-71, Class 125, iron body, bronze trim flanged ends.

2.18 WATER PRESSURE REDUCING VALVES

A. Provide water pressure reducing valve at the service entry on all buildings where main pressure is in excess of 80 psi. Set out pressure at 70 psi.

B. Up to and Including 2 Inches:

1. Manufactures:
   a. Watts Model U5B.
   b. Wilkins, Cash, Acme.
2. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, internal by-pass, inlet strainer, threaded ends with single union and ball valve upstream of strainer.

C. Over 2 Inches:

1. Manufactures:
   a. Watts ACV 115.
   b. Williams, Cash, Acme.
2. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

D. Provide pressure gage (0-150 PSI) with needle valve stop on leaving side of pressure reducing valve

2.19 NATURAL GAS VALVES

A. Manufactures:

1. 2” and smaller:
   a. Watts Series FBV, Conbraco Series GB-10, Nibco GB-1, GB-2, T-FP600.
2. Larger than 2”:
   a. Rockwell 143 lubricated 175 psi.
3. All gas valves shall be third party listed.

2.20 NATURAL GAS ANNODLESS SERVICE LINE RISER

A. Anodless Service line riser, transitions from polyethylene to steel piping, double seal riser.

B. Manufacturer: Elster

2.21 GAS PRESSURE REGULATOR

A. Gas pressure regulators shall be listed as complying with ANSI Z21.80.

B. System Regulator: Equal to American Meter Co. Model 1813B with built-in full capacity relief, size and capacity as shown on drawings.

C. Appliance Regulator: Equal to American Meter Company J-78 for sizes 1/2”, ¾” and 1” and J-48 for sizes 1”-3”.

D. Line Regulator: Equal to Pietro Fiorentini Governor Series.

E. Regulator valves shall be full line size with capacity as shown on Drawings. Provide regulators with positive shut-off and vent limiting device. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior one pipe size larger than vent discharge and elbow down with screened opening per ASME CSD-1 requirements. Provide pressure gauges on inlet and outlet side of all regulators.

F. Gas regulators for building heating condensing boilers and water heaters are to be installed a minimum of 10ft from the boiler connection and 1 pipe size larger. Plumbing contractor to install and adjust regulator per regulator manufacturer's instructions. Provide pressure gauges on inlet and outlet side of all regulators. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior, one pipe size larger than vent discharge connection and terminate with elbow down with screened opening per ASME CSD-1 requirements.

2.22 GAS METERS

A. Service meter by utility company: Pay all costs/fees incurred for new service. Follow all installation guidance set forth by local utility company.

2.23 THERMOMETERS

A. Lights actuated digital thermometer reading in degrees Fahrenheit. Provide with well for minimum 1" insulation.

B. Weiss Vari-angle Digital Thermometer.

2.24 PRESSURE GAUGE (DOMESTIC WATER)

A. Manufacturers:
1. Trerice.
2. Weiss.
3. Weksler.
4. Winters.

B. 4-1/2-inch diameter, minimum dial face, stamped stainless steel, replaceable glass lens, with snap-on rings. Phosphor bronze tube, bronze brushed rotary movement, silver brazed or soldered to brass socket and brass tip, 1/4-inch bottom connection. Accuracy, on (1.0) percent of included scale range. White dial face with black numerals, graduated in pounds; equipped with bronze pulsation dampener or snubber and needle valve.

2.25 SLEEVES

A. Refer to Division 22, Section "Basic Plumbing Materials and Methods" for requirements.

2.26 FIRE STOP SYSTEM

A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. Listed assembly compatible with the rating of the wall or floor being penetrated.

B. Non-rated walls:

1. Sheet rock joint compound may be used to seal opening. Insulation to be continuous through wall.

C. For piping passing through sheet rock walls or partitions:
1. Insulated pipe passing through 2 walls or partitions – Hilti FS605 with sleeve U.L. Listing #WL1056.
2. Insulated pipe passing through 2 hour walls or partitions – Hilti FS611A with no sleeve, U.L. Listing #WL5029. Insulation to be continuous through sleeve.

D. For piping passing through concrete floors, concrete walls or concrete block walls:
1. Uninsulated Schedule 40 steel on copper pipe: Hilti #F5605 with sleeve, U.L. #CAT155.
2. Insulated Schedule 40 steel on insulated copper pipe: Hilti #FS6114A, U.L. #CAT5045.

E. For non-metallic piping passing through concrete floors, walls or concrete block.
1. 2" and smaller piping: Hilti #FS611A, U.L. #CAT2062 or U.L. #CAT2065.
2. Larger than 2": Hilti #FS611A with collar, U.L. #CAT095.

2.27 FLASHING

A. Refer to Division 22, Section "Basic Plumbing Materials and Methods" for requirements.

2.28 ELECTRIC PIPE LINE HEATERS

A. Electric Pipe Line Heaters to be self-regulating heaters applied in a straight line method to the piping prior to installation of insulation.

B. Provide thermostat in area subject to freezing to activate heaters at 45 deg F.

C. Raychem XL-Trace, 5 Watts per foot minimum, 120/1/60, or approved equal.

2.29 WATER HAMMER ARRESTERS

A. Install water piping to ASME B31.9. Closed copper tube chamber with permanently sealed 410 kPa (60 psig) air charge above a Double O-ring piston. Two high heat Buna-N O-rings pressure packed and lubricated with FDA approved silicone compound. All units shall be designed in accordance with ASSE 1010 for sealed wall installations without an access panel. Size and install in accordance with Manufacturers requirements. Unit shall be as manufactured by Precision Plumbing Products, Inc., Watts, or Sioux Chief. Provide water hammer arrestors at:

1. All solenoid valves.
2. All groups of two or more flush valves.
3. All quick opening or closing valves.
4. All washing equipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cut pipe square and ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Provide quarter turn, full port ball valve between all pressure gauges and piping system.

3.2 PIPING INSTALLATION GENERAL

A. Install in accordance with manufacturer's instructions.

B. Provide dielectric fittings wherever jointing dissimilar metals.

C. Make piping connections to equipment with flanges or unions.

D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

E. Run piping concealed, except where specifically shown to be exposed.

F. Install piping to maintain headroom, conserve space, and not interfere with use of space.

G. Group piping whenever practical at common elevations.

H. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.

I. Provide clearance in hanger and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access where valve is not accessible. Provide minimum 18"x18" access doors at valves in hard ceiling.

K. Establish elevations of buried pressure piping outside the building to ensure not less than 18 inches of cover.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 099100.

N. Install chrome plated floor, wall and ceiling plates on all exposed piping passing through finished surfaces in finished spaces.

O. Install bell and spigot pipe with bell end upstream.

P. Install valves with stems upright or horizontal, not inverted.

Q. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, or in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors not acceptable).

R. Pipe Hangers and Supports:
1. Support horizontal piping as scheduled.
2. Install hangers to provide minimum ½-inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, trapeze hangers may be used.
7. Provide copper hangers and supports when applied directly to copper piping.

8. Prime coat exposed steel hangers and supports located outdoors, in crawl spaces, pipe shafts. Above suspended ceiling spaces is not considered exposed.
9. Provide hangers adjacent to motor driven equipment.
10. Support cast iron drainage and vent piping at every joint and minimum 5'-0" on center.
11. Support of all pipe, tubing and fixtures and equipment shall be accomplished by means of engineered products specified to each application. Makeshift, field devised methods of plumbing pipe supports, such as scrap wood, wire or duct tape are not allowed. These shall be HoldRite, B-Line, Sioux Chief or approved equal.

S. Provide pipe line markers in accordance with other sections of the specifications.

T. Sleeves:
1. Refer to Division 22, Section “Basic Plumbing Materials and Methods” for requirements.

U. Flashing:
1. Refer to Division 22, Section “Basic Plumbing Materials and Methods” for requirements.

3.3 EXCAVATION AND BACKFILLING

A. Refer to Division 22, Section “Basic Plumbing Materials and Methods” for requirements.

3.4 APPLICATION

A. Install unions at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system.

C. Install valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Provide check valves on discharge of water pumps.

E. Provide flow indicators in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

A. Slope all sanitary waste piping and storm piping at a minimum 1/8" per foot. Slope all sanitary sewer piping 2" and smaller below slab on grade at a minimum 1/4" per foot.

B. Arrange all water piping to drain to low points and provide ball valve with plug at low point.

3.6 SANITARY, WASTE AND VENT SYSTEM

A. Install vent stacks through roof. Terminate 12 inches above finish roof and minimum 10'-0" from HVAC roof top unit outside air intakes. Flashings for penetrations are under another section.

B. Connect to site sanitary sewer approximately 5'-0" from building. Verify exact size, location and invert with Civil Drawings prior to beginning work.

C. Insulate all mechanical floor drain bodies and horizontal piping between drain and connection to stack on elevated floors.

3.7 STORM WATER SYSTEM

A. Install roof drains and overflow roof drains where shown. Flashing for roof drains is under another section.

B. Connect to site storm sewer system approximately 5'-0" from building. Verify with Civil Drawings exact size, locations and inverts of piping prior to beginning work.

C. Spill on grade or through curb as shown.

D. Insulate all roof drain bodies and horizontal storm piping above grade. Emergency overflow drains and piping need not be insulated.

3.8 WATER PIPING SYSTEM

A. Connect to site water service approximately 5’-0" from building installed under another section. Verify with Civil drawings exact size and location of site water service.

3.9 NATURAL GAS PIPING SYSTEM

A. Arrange with local gas company to provide new gas service complete with connection to gas main, service from main to meter and meter installation all per gas company’s requirements. Include all costs associated with new meter and service.

B. Provide regulators on each line serving gas appliance sized in accordance with equipment requirements. Regulators shall have vent limiting device as required by local code or shall be vented to the exterior. Provide pressure gauge on inlet and outlet side of all regulators.

C. Install no gas piping beneath slabs on grade. Where gas pipe must be installed below building slabs, install in steel encasement with vent to atmosphere. See detail on drawings.

D. Where gas piping is installed exposed on the roof, the piping shall be installed on Erico PP50H6 pipe pier supports with integral strut channel.

E. Where piping is installed out of doors, coat all piping and joints with bituminous asphaltic coating. Do not coat joints until after testing and inspection. Clean rust from pipe prior to applying coating.

F. Install union plug valve or gas shut-off and dirt pocket at each piece of equipment.

3.10 FIELD QUALITY CONTROL

A. Perform all tests as required by local codes. Contractor shall furnish testing equipment and keep a record of all testing listing tests made, results and those witnessing test. Include testing record in close out documents.

B. If local codes are more stringent than the following, local codes shall govern.

C. Sanitary, Waste, Vent and Rain Water Systems:
1. Test piping by stopping lower outlets and filling to 10 feet hydrostatic head for a minimum period of 15 minutes with all joints exposed throughout test. Stop all leaks and retest system until tight.
2. Test all piping by stopping all outlets and applying 5 pounds per square inch of air pressure to the system for a period of 15 minutes. Stop all leaks and retest system until tight.
3. Provide ball test on all piping 3" and larger.

D. Domestic Water Piping:
1. Hydrostatic test at 150 psig without pressure drop for 4 hours. Stop all leaks and retest system until free from leaks.
2. Leave City pressure on system for duration of project.

E. Natural Gas Piping:
1. Air pressure test at 25 psig without pressure drop for 4 hours.
2. Black steel piping below grade shall be Holiday tested prior to backfilling.

3.11 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify hot and cold water systems are complete, flushed and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6.

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 ppm residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 ppm, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water.

H. Submit sample of water from all new or modified systems to local Health Department and receive certification that water is acceptable for human consumption. Include certification of water in close out documents.

3.12 SCHEDULES

A. Pipe Hanger Spacing:
1. Metal Piping:
   a. Pipe size: 1/2 to 1-1/4 inches:
      1) Maximum hanger spacing: 6.5 ft.
      2) Hanger rod diameter: 3/8 inch.
   b. Pipe size: 1-1/2 to 2 inches:
      1) Maximum hanger spacing: 10 ft.
      2) Hanger rod diameter: 3/8 inch.
   c. Pipe size: 2-1/2 to 3 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 to 6 inches:
1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 5/8 inch.

e. Pipe size: 8 to 12 inches:
1) Maximum hanger spacing: 14 ft.
2) Hanger rod diameter: 7/8 inch.

f. Pipe size: 14 inches and over:
1) Maximum hanger spacing: 20 ft.
2) Hanger rod diameter: 1 inch.

2. Plastic Non-Metallic Piping:
a. All Sizes:
1) Maximum hanger spacing: 4 ft.
2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 22 0440
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing fixtures.

B. Plumbing miscellaneous equipment.

1.2 RELATED SECTIONS

A. Section 220401 – Basic Plumbing Requirements.

B. Section 220403 – Basic Plumbing Materials and Methods.

C. Section 220405 – Identification for Plumbing Piping and Equipment.

D. Section 220407 – Plumbing Systems Insulation.

E. Section 220410 – Plumbing Piping.

1.3 SUBMITTALS FOR REVIEW

A. See Section 220401, Submittal for Review.

B. Plumbing Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, trim and finishes.

1.4 SUBMITTALS AT PROJECT CLOSEOUT

A. Refer to Division 01 and Section 220401 – Submittals for Project Closeout.

B. Maintenance Data: Provide 3 sets of manufacturer's maintenance and parts listing including the manufacturers nearest sales and service representative. Include the sales representative's address and telephone number. Provide with the listing, a suggested maintenance schedule for all equipment along with warranty dates. Items are to be provided in three ring binders with tabs identifying different equipment types.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years' experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Accept fixtures on site in factory packaging, inspect for damage and store.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

A. See other sections of the specification for additional warranty information.

B. The Contractor shall warrant all materials, workmanship and equipment for a period of one year from the date of substantial completion. Any defect in equipment or workmanship shall be made known to the Contractor within 1 year. Such deficiencies shall be corrected by the Contractor at no cost to the Owner.

1.9 EXTRA MATERIALS

A. See other sections of the specification for additional extra material requirements.

B. Provide two sets of cartridges or washers for all faucet types, two flush valve repair kits for all flush valve type and one loose key for each hose bibb or wall hydrant.

PART 2 - PRODUCTS

2.1 DRAINS

A. Mechanical Room Floor Drains (MFD): Mifab #1340-5 with sediment bucket. Provide deep seal trap, trap guard and coordinate exact location with HVAC equipment. Insulate suspended drain body and all horizontal piping serving mechanical floor drain until piping turns vertical.

B. Roof Drain (RD): Zurn Z100, complete with underdeck clamp and cast iron or aluminum dome. Provide 4" high, 1/16" thick perforated stainless steel gravel stop around dome.

C. Roof Overflow (ROF): Terminate open pipe 3" above finish roof. Flashing same as V.S.T.R.

D. Downspout Nozzle (DS): Zurn Z199-DC complete with wall flange and bird screen in opening. Securely anchor flange to wall and caulk water tight.

E. Floor Drain (FD) and Shower Drain (SD): Mifab 1100-C-1 with 6" nickel bronze reinforced grate. Provide trap guard on floor drains and deep seal trap.

F. Floor Sink (FS): Mifab FS1750-175, 8" diameter, 6" deep porcelain enameled cast iron interior with three (3) quarter cast iron porcelain enameled grate and dome bottom strainer.

G. Hub Drain (HD): Open pipe with Jay R. Smith 3951 or 3955 fixed air gap fitting.

H. Trap Guard (TG): J.R. Smith #2692 quad close “stink stopper” trap seal device.

2.2 WALL HYDRANT

A. J.R. Smith #5519 ASSE 1052 listed wall hydrant, with integral backflow preventer, latching cover, freeze-proof and all bronze box. Provide casing of sufficient length in order that valve seat be on building side of exterior wall insulation. Install with center line 24" above finish grade and provide Owner with one (1) loose key for each wall hydrant.

2.3 HOSE BIBB

A. HB-1 Finished areas (in wall): J.R. Smith #5618 narrow wall hydrant, all bronze with integral vacuum breaker, and loose key.

2.4 ROOF HYDRANT

A. Woodford Model RHY2-MS freezeproof roof hydrant with dual check back flow preventer, hydrant support and boot cover, under deck flange with mounting bolts and water connection with no drain required.

2.5 CLEANOUTS

A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angle, upper terminals and not over 75 feet apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk tapered slotted plugs, except PVC waste piping cleanouts, which shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, piping larger than 6" shall have minimum 6" cleanout covers.

B. Exposed Cleanouts: Cast brass plug type, J.R. Smith #4470.

C. Wall type cleanout plug and access covers, J.R. Smith #4472. Cleanout plug must be within 1" of finish wall and must be tapped for access cover.

D. Install wall cleanouts on stacks at flush valve fixtures 12" above top of flush value, 12” above top of flush tanks, 12" above finish floor on sinks, lavatories and water coolers and 12" above grab bars at fixtures with grab bars. Locate cleanouts to clear baseboard at floor.

E. Floor type cleanout access covers: J.R. Smith #4248-NB. Plug must be within 3" of finished floor. Provide J.R. Smith #4188 where installed in terrazzo floors and J.R. Smith #4168 where located in floor with asphalt or vinyl tile covering. Grout cleanout below access cover to seal watertight. Provide option "Y" cleanout carpet markers where installed in carpeted floors.

F. Floor type cleanout covers for acid waste piping: J.R. Smith #4940.

G. Outside Cleanouts: J.R. Smith #4258 cleanout access encased in a 18" X 18" X 6" deep concrete pad. See Detail on Drawings.

2.6 PLUMBING FIXTURES AND EQUIPMENT

A. Unless otherwise specified, all fixtures complete as catalogued, commercial grade, white color, exposed metal trim chromium plated.

B. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lug bolts in all holes as recommended by the manufacturer.

C. Flush valve "YJ" supports shall be installed 1 inch below vacuum breaker on all water closet flush valves and around vacuum breaker on urinal flush valves. Handles on A.D.A. water closets to be installed on wide side of room or stall.

D. Seal wall hung fixtures at wall with white silicone sealant. Seal countertop fixtures with clear silicone sealant.

E. Seal floor mounted water closets to floor with white silicone sealant.

F. Mount all fixtures at standard mounting height unless otherwise noted.

G. All faucets to be furnished with ceramic discs.

H. Furnish sinks and lavatories with correct number of drillings required for the faucet and accessories. Hole covers are not acceptable.

I. All similar products shall be by the same manufacturer.

J. 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.

K. All items complete as catalogued as follows:

WC-1 Water Closet:	Wall Hung - Kohler K-84325 complete, Sloan Regal #111-1.6 SFSM flush valve with YJ bracket, Church "Dura Guard" model #2155SSCT seat and J.R. Smith Series 100 or 200 carrier and fitting.
WC-2 Water Closet:	Wall Hung - Kohler K-84325 complete, Sloan Regal #111-1.6 SFSM flush valve with YJ bracket, Church "Dura Guard" Model #2155SSCT seat, and J.R. Smith Series 100 or 200 carrier and fitting. Mount with rim at 17" above finish floor. Must meet A.D.A.
WC-3 Water Closet:	Floor Mounted - Kohler K-96057 complete, Sloan Regal #111-1.6 SFSM flush valve with YJ bracket and Church "Dura Guard" Model #2155SSCT seat. Must meet A.D.A.
UR-1 Urinal:	Wall Hung – Kohler K-5016-ET complete, Sloan ECOS 8186-0.5 Sensor flush valve with YJ bracket, J.R. Smith #637 fixture support.
UR-2 Urinal:	Wall Hung - Kohler K-5016-ET complete, Sloan ECOS 8186-0.5 Sensor flush valve with YJ bracket, J.R. Smith #637 fixture support with lip 17" above finish floor. Must meet A.D.A.
LAV-1 Lavatory:	Countertop - Kohler K-2196 complete Sloan SF-2150 battery sensor faucet w/ 0.5 gpm aerator faucet, McGuire 155A outlet with tailpiece, McGuire 165 stops with supplies and McGuire 8872C P-Trap. Insulate P-trap, stops and supplies with McGuire ProWrap insulator kit. Provide TMV-1 with wall bracket installed below bowl. Must meet A.D.A.
LAV-3 Lavatory:	Wall Hung - Kohler K-2030 (20" X 18") complete, Sloan SF-2150 battery sensor faucet w/ 0.5 gpm aerator faucet, McGuire 155A outlet with tailpiece,

	Zurn Z1231EZ-WL fixture support, McGuire 165 stops with supplies and McGuire 8872C P-Trap. Insulate P-trap, stops and supplies with McGuire ProWrap insulator kit and install with rim at 31" above finish floor. Provide TMV-1 with wall bracket installed below bowl. Set hot water temperature at 109 deg F.
EWC-1 Electric Water Cooler:	Elkay #EZSTL8WSLK bi-level water cooler with sensor activated bottle filling station with all stainless steel cabinet and waterways that are manufactured of 100% lead free material, J.R. Smith #834 fixture support, McGuire 8912C P-Trap and McGuire 165 stop with supply. Fully insulate P-Trap with McGuire ProWrap insulator. Install with lower spout outlet maximum 36" AFF. Must meet A.D.A.
JC-1 Janitors Receptor:	Stern Williams #HL-1800 (24" X 24") complete, T-35 hose with wall hook, stainless steel backsplash and T&S Brass B-0665-BSTR faucet with integral stops and spring checks.
SK-1 Sink:	Elkay LR2219, LK-35 strainer, T&S Brass B-2865: Gooseneck, separate faucet, and handles faucet, McGuire 8912C P-Trap and McGuire 165 stops with supplies.
SK-2 Sink:	Elkay LR3319, LK-35 strainers T&S Brass B-2865: Gooseneck, separate faucet, and handles faucet with, McGuire 111 waste, McGuire 8912C P-Trap and McGuire 165 stops with supplies.
SH-1 Shower Valve	Delta Model T13291 pressure balanced mixing valve with integral checks, field adjustable handle rotation handle, #RP38357 Shower Head, arm over and flange.
SH-2 Shower Valve	Delta Model T13H332 pressure balanced mixing valve with, integral checks, field adjustable handle rotation, #3 Shower head, arm over and flange, Hand shower with 24” stainless steel bar with slide for hand shower. Delta model R10700-UNWS forged brass diverted valve
TMV-1 Thermostatic Mixing Valve:	Leonard Model 170D-LF Thermostatic mixing valve, installed in the “H” position with bracket secured to wall under all public and ADA lavatories. Valve must meet the minimum flow rate of .25 gpm. Set hot water temperature at 109 deg F and pipe as detailed on drawings. Must meet ASSE 1070.
CM-1 Coffee Maker:	Furnished and installed under another Section. Provide in wall above the countertop a Brasscraft KTCR19 1/4 turn angle ball stop, escutcheon plate and 10 feet of 1/4" soft copper for connection to coffee maker.
IM-1 Ice Maker:	Furnished and installed under another Section, rough and connect complete. Provide ball valve stop on supply and pipe waste(s) to floor sink.

	Provide Watts 9D on cold water supply if required by Local Codes. Pipe relief full size to floor sink.
WMB-1 Washing Machine Box:	Sioux Chief Ox Box 6962313MF with water hammer arrestors.
EWH-1 Electric Water Heater:	Lochinvar JER-20 SCF with a storage capacity of 20 gallons. Set with outlet temperature of 125 deg F. Provide P & T relieve valve and install as detailed on Drawings. 2.5KW, 120/1/60. Verify voltage with Electrical Section. Provide with Holdrite Quick Stand floor stand 40-S-22-A or Quick Stand wall mounted platform 50-SWHP-W on platform.
GWH-1 Gas Water Heater:	Lochinvar Shield SWR200N, complete with all standard accessories plus vent kit, condensate neutralization kit, and P&T relief valve. Heater shall be capable of raising 232 gallons of hot water from 40 deg F to 140 deg F per hour. 199,000 BTU/hr input. Install as detailed on Drawings.
ET-1 Expansion Tank:	Amtrol Therm - X-Trol #ST-5 expansion tank. Pre-charged, with all wetted internal parts being FDS approved. Isolation between water and air shall be by a Butyl Diaphragm. Provide with 5-year warranty.
RCP-1 Circulator Pump:	Grundfos Model Alpha HWR 15-55 SF. All Bronze. Provide with internal digital timer.

2.7 ELEVATOR SUMP PUMP

A. ESP-1 Elevator Sump Pump (Traction Elevator Pit, Single Shaft): Liberty Model # ELV280 system complete submersible 0.5 hp pump, control panel and leads of sufficient length to reach from pump to control box unbroken. Provide a 4" PVC conduit through wall between elevator and control panel. Install wiring through conduit and seal providing a 2-hour water tight closure. 115/1/60. See detail on Drawings.

2.8 ACCEPTABLE MANUFACTURERS

A. Where Kohler is listed above, Toto, Zurn, Mansfield, or American Standard may be substituted.

B. Where Sloan is listed above, Delaney, Toto and Zurn may be substituted.

C. Where J. R. Smith is listed above, Josam, Zurn, Mifab, Watts, Jones Stephens or Wade may be substituted.

D. Where Elkay water coolers are mentioned above, Halsey Taylor, Oasis, Acorn, or Aqua may be substituted, only if water ways are constructed of totally lead free materials.

E. Where Grundofs is listed above, the equal of B & G, Hyfab, ITT-Bell & Gossett, Taco, Armstrong, or Thrush may be substituted.

F. Where Elkay or Franke sink(s) are listed above, Just or Advance Tabco may be substituted.

G. Where Church is listed above, Bemis, Beneke, Centoco, Olsonite or Comfort Seats may be substituted.

H. Where Leonard is listed above for shower control valves, Delta, Speakman, Symmons, Powers, Acorn, Moen Commercial, or Zurn may be substituted.

I. Where T&S Brass is listed above, Chicago, Speakman, Kohler, Royal, Cambridge, Moen Commercial, or Zurn may be substituted, provided manufacturer can furnish all fixture brass specified.

J. Where Lochinvar Shield water heaters are listed above, A.O. Smith “Cyclone”, Rheem “Spider Fire”, or HTP “The Phoenix” may be substituted.

K. Where Stern Williams is listed above, Acorn, Fiat, Mustee, or Florestone may be substituted.

L. Where McGuire is listed above for traps, supplies and stops, Kohler, Crane, Eljer, Zurn, Dearborn, or American Standard may be substituted.

M. Where J.R. Smith trap guards are listed above, ProSet and Sureseal may be substituted.

N. Where Chicago is listed above for T&P shower valves, Leonard, Powers, Acorn or Lawler may be substituted.

O. Where McGuire ProWrap is listed above, "Handi Lav-Guard" by Truebro, "Trap-Wrap" by Brocar Industries, Inc., Dearborn, or Plumberex may be substituted.

P. Where Amtrol is listed for expansion tanks, John Wood, Watts, ITT-Bell & Gossett, Elbi, or Armstrong may be substituted.

Q. Where Liberty is listed above, Stancor, Bell & Gossett or See Water may be substituted.

R. Where J.R. Smith is listed for wall hydrants; Woodford, Zurn, Josam, Watts, or Mifab may be substituted.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify all electrical characteristics of electrical motors, starters and equipment with Electrical Drawings. Should the Contractor change the characteristics of the electrical equipment, it shall be the responsibility of the Contractor to coordinate all changes with the other trades and bear all costs of such changes.

B. Coordinate all cutouts in millwork and casework with supplier for proper cutout dimensions.

C. Install all fixtures and equipment in accordance with manufacturer's recommendations.

D. All wall hung fixtures are to be installed on floor mounted fixture supports. Fixture supports are to be anchored to floor with anchors in all mounting holes. Anchors to be sized as per the manufacturer’s recommendations. Seal all fixtures to walls and floor with white silicone sealant. Seal all sinks to counter tops with clear silicone sealant.

E. Adjust all stops, flush valves, and valves for intended water flow rate.

F. Clean plumbing fixtures and equipment and remove tags.

G. Install all electric water heaters with clearance for removal of heating elements.

H. Provide backing in wall for flush valve YJ brackets, faucet supports, etc. Anchor to the backing with anchoring screws of sufficient length to penetrate backing. See Section 220410, Part 3.

I. Provide stops with chrome-plated nipples penetrating wall and cover penetrations with chrome-plated escutcheons. Note: Compression type stops and plastic stems are not acceptable.

END OF SECTION

SECTION 230010

GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of General HVAC Administrative and Procedural Requirements which apply to all Division 23 sections.
   1. Definitions.
   2. Abbreviations and Acronyms.
   3. Regulatory Requirements.
   4. Fees, Permits, and Inspections.
   5. Substitutions.
   6. Submittal Requirements.
   7. Temporary Use of HVAC Equipment.
   8. Products Requirements.
   9. Closeout Documents.
   10. Summary of the Work.
   11. Installer's Qualifications.
   12. Drawing Interpretation and Coordination.
   13. Project/Site Conditions.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification sections apply to all Division 23 Specification sections.

1.3 RELATED SECTIONS

A. Section 012300 "Alternates" for administrative and procedural requirements for alternates. Coordinate related Division 23 work and modify surrounding work to integrate the work of each Alternate.

B. Section 012500 "Substitutions" for administrative and procedural requirements for substitutions requests post bid and negotiation.

C. Section 013100 "Project Management and Coordination" for administrative and procedural provisions for Building Information Modeling.

D. Section 013300 "Submittal Procedures" for administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

E. Section 015000 "Temporary Facilities and Controls" for temporary use of permeant HVAC equipment.

F. Section 016000 "Product Requirements" for administrative and procedural requirements for selection of products for use in Project; and comparable products.

G. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual.

H. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

I. Section 017900 "Demonstration and Training" for instructing Owner's personnel.

1.4 DEFINITIONS

A. Approved: When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

B. Directed: A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

C. Indicated: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

D. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

E. Install: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

F. Provide: Furnish and install, complete and ready for the intended use.

G. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

H. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

I. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

J. Subsystem: A portion of a system with characteristics similar to a system.

1.5 ABBREVIATIONS AND ACRONYMS

A. AFF: Above Finished Floor.

B. AGA: American Gas Association.

C. AMCA: Air Movement and Control Association International, Inc.

D. ANSI: American National Standards Institute, Inc.

E. ARI: Air-Conditioning & Refrigeration Institute.

F. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.

G. ASME: American Society for Mechanical Engineers.

H. ASTM: American Society of Testing and Materials.

I. MEPFP: Mechanical, Electrical, Plumbing, Fire Protection.

J. MSS: Manufacturers Standardization Society of the Valve and Fitting Industry.

K. NAIMA: North American Insulation Manufacturers Association.

L. NEMA: National Electrical Manufacturers Association.

M. NFPA: National Fire Protection Association.

N. NPS: Nominal Pipe Size.

O. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

P. UL: Underwriters Laboratories, Inc.

1.6 REGULATORY REQUIREMENTS

A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations. Where specific code requirements apply, they shall be included in the job, whether or not specifically shown or elsewhere specified.

1. ADA – Americans with Disabilities Act.
2. ASME B31.9 – Building Services Piping.
3. ASHRAE 15 – Safety Code for Mechanical Refrigeration.
4. ASHRAE 62 – Ventilation for Acceptable Indoor Air Quality.
5. ASHRAE 90.1-2013 – Energy Standard for Buildings Except Low Rise Residential Buildings.
6. NFPA 30 – Flammable and Combustible Liquid Code.
7. NFPA 54 – National Fuel Gas Code.
8. NFPA 70 – National Electrical Code.
9. NFPA 90A – Installation of Air Conditioning and Ventilating Systems.
10. NFPA 96 – Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

11. NFPA 101 – Life Safety Code.
12. IBC – International Building Code with Fire, Mechanical, Plumbing and Gas Codes; 2015 Edition.
13. Alabama Boiler and Pressure Vessel Safety Act.
14. Local Health Department.

B. 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.

C. Fees, Permits, And Inspections
1. All required fees, permits, and inspections of all kind shall be obtained and paid for by the Contractor under the section of the specifications for which they are required.
2. Obtain and pay for all certificates of required inspections, and file certificates with Owner.

1.7 SUBSTITUTIONS

A. Conform to the requirements of Section 012500 “Substitutions.”

B. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms will be considered by the Architect provided the correct data is submitted and validation of the reason of the request.

C. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner, which are favorable to the Owner in schedule or dollars, may be considered by the Architect providing the correct data is submitted and validation of the reason of the request.

1.8 SUBMITTAL REQUIREMENTS

A. General: Prepare and submit submittals required by individual Specification Sections under provisions of Section 013300 “Submittal Procedures” and the following:

B. Digital Data Files:
1. Electronic digital data files of the Project drawings may be provided by Engineer for Contractor's use in preparing submittals.
2. Electronic digital data files supplied for use in submittal preparation will be subject to terms and conditions of the Engineer’s Release Form. A signed release form and any payment required must be returned to the Engineer prior to the transmission of an electronic digital data files.
3. Electronic digital data file formats may include AutoCAD drawings, Revit converted to AutoCAD drawings or Revit Model.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Submittals shall be submitted by Section. Do not include products or materials from multiple sections in a single electronic file.
2. Name file with submittal number or other unique identifier, including revision identifier.
a. File name shall use Specification Section number.

D. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

E. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment that are to be provided under Division 23.
1. List shall be complete with manufacturer’s names, catalog number, dimensions, specifications, rating data, and options utilized. Capacities shall be in the terms specified.
2. Call attention to deviations from specified items as to operation and physical dimensions.
3. Performance curves for equipment such as fans and pumps shall be included.

F. Shop Drawings: Before starting work, submit and obtain approval from Architect of detailed drawings of the following, fully dimensional (including elevations of ductwork and piping) and drawn to 1/4” to 1’-0” scale. Submit electronic file of each drawing in PDF format. Engineer will return electronic copy of marked-up drawings.
1. Ductwork (coordinate diffuser locations with architectural reflected ceiling drawings). See Section 233113 “Metal Ducts.”
2. Mechanical Equipment Rooms: Complete layouts for mechanical equipment rooms (boiler rooms, energy plants, fan rooms, etc.) showing:

a. Support column locations.
b. Location and dimensions of equipment foundation and pads.
c. Location and dimension of equipment and apparatus including electrical control panels, starters, VFDs, service and coil pull areas.
d. Coordinate with electrical contractor and indicate electrical equipment location(s) i.e., panels, electrical conduit runs and stubs for motors, code clearances, etc.
e. Dimensioned floor-drain locations.
f. Layouts to be based on actual equipment being provided.

3. Equipment piping.
4. Submit complete automatic temperature control system control and power wiring diagrams for approval before installing controls. See Division 23 Section "HVAC Instrumentation and Controls."

1.9 TEMPORARY USE OF MECHANICAL EQUIPMENT

A. Use of permanent HVAC equipment to provide heat, air conditioning and ventilation during construction will be permitted subject to compliance. The requirements of, Section 015000 "Temporary Facilities and Controls" and the following:
1. Equipment shall not be started until a written request is submitted by the Contractor and reviewed and approved by the Engineer.
2. Permanent HVAC system shall not be started until permanent doors and exterior windows are in place and the building is relatively dust free. At a minimum, the floors shall be broom cleaned and drywall finishing and painting complete.
3. Boilers, chillers, and other equipment specified to have factory supervised start-ups shall have such said start-up.
4. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
5. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
6. Install minimum MERV 8 filters in all air handling units. Change filters as required during construction process. Install scheduled filter elements at completion of construction and prior to testing and balancing of systems.
7. All return air, outside air and exhaust air openings shall have temporary MERV 8 filter media installed over inlet side of opening and secured air tight there to. Change out filters as required during the construction process. If Contractor does not comply with this requirement, Contractor will be required to clean entire duct system at his expense.
a. At Contractor's option, in lieu of filtering OSA, close OSA damper tight. (This option does not apply to 100% outside air units or units with limited capacity return air systems.)
b. At Contractor's option, in lieu of filtering return and exhaust grilles, close return air damper(s) tight, off exhaust systems and run air handlers at 100% outside air at reduced air flow.
8. All components of chilled water and heat production, unitary heating and cooling equipment, and air handlers and associated piping and air distribution system, used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained, and inspected prior to acceptance by the Owner.
a. Pump Seal Flush: Contractor shall change the pump seal flush line cartridge filter after the system has been flushed and on a regular basis thereafter until Substantial Completion.
9. Antifreeze shall be installed in all systems for which it is scheduled or specified.
10. Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identified replacements, at no additional cost to the Owner.
1. All supply, return and exhaust grilles, registers and diffusers to be cleaned.

C. Warranty dates shall start at Date of Substantial Completion. Provide extended warranty from equipment manufacturers to cover time period between start-up and substantial completion.

1.10 PRODUCT REQUIREMENTS AND COMPATIBLE PRODUCTS

A. Provide products in accordance with Section 016000 “Product Requirements” and the following.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Basis-of-Design Product Specification:

1. General: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design" including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor’s bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved, and the effect on other trades has been included in the Contractor’s proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor.
3. The basis of design manufacturer’s equipment has been used to determine space requirements. Should another approved manufacturer’s equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
4. The basis of design manufacturer’s equipment and scheduled mechanical equipment electrical requirements has been used to coordinate the electrical requirements of the HVAC equipment with the electrical systems serving that equipment.
    a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the power distribution system required by that equipment at no additional cost to the Owner.
    b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.
    c. Refer to Section 230053 “Basic HVAC Material and Methods” Article “Coordination” for additional requirements.
5. Each bidder may submit to the Architect a list of any Comparable Products which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutions. To be considered, such requests must be delivered to the office of the Architect no later than 10 days prior to bid due date. The submittal shall include the following:
    a. Specific equipment or material proposed for substitution giving manufacturer, catalog, and model number.
    b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
    c. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
    d. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    e. Evidence that proposed product provides specified warranty.
    f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
    g. A statement setting forth any changes in other materials, equipment or Work of other trades that incorporation of the substitute may require.

D. Value Engineering / Value Analysis (VE/VA)

1. If this project undergoes a value engineering or value analysis process, the Contractor/Bidders are required to do the following:
   a. If the Contractor's VE or VA offering is based on products other than the scheduled or specified **basis of design**. The Contractor shall inform all trades of the offering so the effect on other trades is included in the General / Mechanical Contractor's proposal. Coordination with other trades for substituted equipment or use of products, other than the named basis of design, shall be the responsibility of the Contractor furnishing the equipment.
   b. The Contractor shall be responsible for determining that offered equipment will fit space allocated. Submission of the VE or VA offering shall be considered as indicating that the Contractor has reviewed the space requirements and the equipment will fit in the space allocated with due consideration given to access required for maintenance and code purposes.
   c. The burden of proof of the merit of the proposed substitute is upon the proposer.

1.11 CLOSEOUT DOCUMENTS

A. Submit under provisions of Section 017700 "Closeout Procedures" and Section 017839 "Project Record Documents" and the following:

B. Record Drawings:
   1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the HVAC ductwork, HVAC piping, and HVAC control drawings.
   2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
   3. Record changes daily on a set of prints kept at the job site.
   4. Submit prints, marked as noted above, to Architect for review prior to request for final payment.
   5. Marked prints will be returned to Contractor for use in preparing Record Drawings.

C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of one (1) hard copy and electronic files of the following: (Submit electronic copy for approval prior to generating hard copy.)
   1. Record Drawings - sheet metal work. Electronic files in PDF and AutoCAD.
   2. Record Drawings – piping. Electronic files in PDF and AutoCAD.
   3. Record Drawings – controls systems.
   4. Air Balance Report - (Section 230950 "Testing, Adjusting and Balancing.")
   5. Approved Equipment Submittal Data.
   6. Equipment operating and maintenance manuals.
   7. Equipment warranty dates and guarantees.
   8. List of Owner's personnel who have received operating and maintenance instructions.
   9. Letter signed by Owner or his representative certifying that the Owner has received the extra materials specified for each system:
      a. Spare filters.
   10. Submit factory start-up/field reports for:
      a. AC Units
      b. ERUs
      c. VRFs
      d. Ductless Splits

1.12 SUMMARY OF WORK

A. Scope: Provide all labor, materials, and equipment and services necessary for the completion of all mechanical work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

1.13 QUALITY ASSURANCE

A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
   1. Acceptable to, or licensed, by manufacturer.
   2. Not less than 3 years' experience with systems.

3. Successfully completed not less than 5 comparable scale projects using systems similar to those on this project.

1.14 DRAWING INTERPRETATION AND COORDINATION

A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.

B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and layout work so as to fit in with ceiling grids, lighting, and other parts.

C. Make minor adjustments in the field, as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.

D. Where doubt arises as to the meaning of the Drawings and Specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

E. Refer to Architectural drawings for all dimensions and locations of ceiling diffusers.

1.15 PROJECT/SITE CONDITIONS

A. Visiting Site: Visit site and become familiar with location and various conditions affecting this Work. No additional allowance will be granted because of lack of knowledge of unforeseen conditions.

B. Cause as little interference or interruption of existing utilities serving existing facilities as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all other affected trades.

PART 2 - PRODUCTS – Not Used.

PART 3 - EXECUTION – Not Used.

END SECTION 230010

SECTION 230053
BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of common piping, equipment, materials and installation for HVAC systems.

B. This Section includes the following:
1. Low-emitting material requirements.
2. Sleeves.
3. Concrete.
4. Grout.
5. Escutcheons.
6. Flashing
7. Access doors - Building.
8. Workmanship.
9. Cutting and patching.
10. Equipment installation - Common Requirements.
11. Painting and finishing.
12. Concrete bases.
13. Supports and anchorages.
14. Protection and cleaning of equipment and materials.

1.2 RELATED SECTIONS

A. Section 078413 “Penetration Firestopping” for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

B. Section 017300 "Execution" for cutting and patching procedures.

C. Section 083113 “Access Doors and Frames” for building access doors.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations and equipment mounted at grade.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and within chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. PE: Polyethylene plastic.
2. HDPE: High density polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Escutcheons.
2. Access doors - building.

1.5 INFORMATIONAL SUBMITTALS

A. Floor penetration sleeves and openings: For multi-story buildings, submit a detailed drawing at minimum eighth (1/8) scale, indicating all penetrations through floor slabs noting duct and pipe sizes, hole sizes with dimensions off column lines to the center of the holes.

B. Podium Slab Penetrations: Submit a detailed drawing at minimum eighth (1/8) scale, indicating all penetrations through the podium slab noting duct and pipe sizes, hole sizes with dimensions off column lines to the center of the holes.
   1. Podium Slab Penetration drawings shall include the following:
      a. HVAC drain line piping penetrations.
      b. Refrigerant piping penetrations.
      c. Supply, OSA, transfer and exhaust duct penetrations.
      d. Control conduit.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation or moisture damage.

C. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

E. For ductwork and HVAC equipment, refer to Part 3, Article “Protection and Cleaning of Equipment and Materials.”

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate installation of building access doors for HVAC items requiring access that are concealed behind finished surfaces.

D. Electrical Characteristics for HVAC Equipment:
   1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.
   2. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system required to accommodate HVAC equipment that has different electrical power requirements from that equipment used as basis-of-design, or the power provisions as shown on the Electrical Drawings.

PART 2 - PRODUCTS

2.1 LOW EMITTING MATERIALS – ADHESIVES AND SEALANTS

A. All adhesives and sealants used on the interior of the building (i.e. inside of the weatherproofing system and applied on-site) must comply with the following requirements as applicable to the project scope:
   1. Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168 requirements effective July 1, 2005 and rule amendment date of January 7, 2005.

2. Aerosol adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

2.2 SLEEVES

A. Galvanized-Steel Sheet: 20-gauge minimum thickness; round tube closed with longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Factory Fabricated Sleeving System:
1. Basis of Design Manufacturer: HoldRite HydroFlame Pro Series Hollow Sleeves.
2. General: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer non-metallic (polypropylene) sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket
3. Provide telescoping and non-telescoping as required.
4. Provide with Mid-Body Water Seal and" locator whiskers."

D. Refrigerant Piping: Refer to Section 230183 "Refrigerant Piping" for exterior wall and roof penetrations.

E. Sealant: Refer to Section 078413 "Penetration Firestopping" for fire- and smoke-stopping penetration sealant requirements.

F. Stuffing Insulation: Glass fiber type, non-combustible.

2.3 CONCRETE

A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28-day compressive strength of 3000 psi.

2.4 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
1. Finish: Polished chrome-plated.

2.6 ACCESS DOORS – BUILDING

A. Refer to Division 8 Section "Access Doors and Frames" for requirements for building access doors.

B. Size: 16-inch x 16-inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.7 FLASHING

A. Metal Flashing: Galvanized steel for ferrous items, stainless steel for stainless steel duct, and aluminum for aluminum duct.
1. Galvanized Steel: Minimum 22 gauge.
2. Stainless Steel: Minimum 20 gauge.
3. Aluminum: Minimum 20 gauge.
4. Copper: Minimum 24 oz. per square foot.

B. Metal Counterflashing: Of same materials and gauges specified for base flashing.

C. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

D. Pitch Cups: 20-gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

E. Curbs for roof mounted air conditioner units, fans, gravity vents, etc. are specified with equipment.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. First class and in accordance with best practice. Work to be orderly, neat, workmanlike in appearance and performed by skilled craftsman.

B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.2 CUTTING AND PATCHING

A. Comply with Section 017300 "Execution" for cutting and patching procedures and the following:

B. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of HVAC work. Repair and finish to match surrounding.

C. Architect's approval required before cutting any part where strength, or appearance of finished work is involved.

D. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.

E. Core drill or saw cut openings in existing masonry construction.

3.3 SLEEVES

A. Sleeves are not required for core-drilled holes.
   1. Exception: In mechanical room floors and other potentially wet areas, provide 4-inch x 4-inch curb or 1-1/2-inch angle ring or square, set in silicone adhesive around penetration. Refer to Section 079200 "Joint Sealants" for sealant materials and installation.

B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
   1. Cut sleeves to length so that sleeve extends out 1/2-inch from both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2-inches above finished floor level. Caulk space outside of sleeves water tight.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Use the following sleeve materials:
      a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
      b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves1/2-inch larger than pipe or pipe covering. Provide ductile iron sleeves for below grade penetrations.
   4. Factory Fabricated Sleeving System: Install penetration firestopping system to comply with manufacturer's published installation instructions and drawings for products and applications indicated.
   5. Where piping or ductwork penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.
   6. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Section 079200 "Joint Sealants" for sealant materials and installation.
   7. Provide for continuous insulation wrapping thru sleeve.
   8. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.

C. Fire-Rated Penetrations: Where pipes pass through smoke-rated, fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Refer to Section 078413 "Penetration Firestopping" for materials and installation methods.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.

E. Install equipment to allow right of way for piping installed at a required slope.

F. 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.

3.5 PAINTING AND FINISHING

A. Except as specified below or noted on the Drawing, requirements for painting of HVAC systems, equipment, and components are specified in Sections 099123 "Interior Painting" and 099113 "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Paint water pipe and insulation downstream of backflow preventor (non-potable water) to termination point, or to connection with mechanical system piping, purple.

D. Shop prime and field paint all miscellaneous steel supports which are not galvanized.

E. Galvanized surfaces damaged during installation shall be repaired with a galvanized repair compound complying with Mil Spec DOD-P-21035B.

3.6 CONCRETE BASES

A. Provide concrete foundations with nominal dimensions conforming to the following schedule for floor-mounted equipment:

Equipment	Foundation
Air handling units	4-inch high pad
Internally isolated air handlers equipped with factory mounted rails	4-inch high pad
Exposed ductwork floor penetrations	4-inch wide x 4-inch high full perimeter curb – seal water tight to slab
Equipment and piping stands and supports	4-inch high pad
Equipment located in equipment rooms, not listed above	4-inch high pad or as indicated on the Drawings
Energy recovery units	8-inch high pad

B. Outdoor equipment sitting on a large structural pad (e.g. packaged air-cooled chiller, fluid cooler, etc.), still requires a minimum 6-inch high level housekeeping pad.

C. Concrete bases shall be continuous and shall have beveled edges and smooth float finish. Concrete bases shall be reinforced with No. 3 bars a maximum of 12-inch on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.

D. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.

E. Concrete pads shall extend a minimum of 4-inches beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.

F. Equipment attached directly to foundations; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation. Vertical inline pumps are not to be anchored to concrete base.

G. Fill voids between baseplates and foundations, and level equipment, with grout.

H. For exterior slabs mounted on grade, increase slab thickness as required based on site conditions to maintain level install. Slab height shall not exceed 30-inches above grade.

I. For existing concrete bases to be re-used, extend bases a minimum of 4-inches beyond the new equipment footprint. Bases shall be installed in accordance with the requirements listed in this section and details on the drawings.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Section 055000 "Metal Fabrications" requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding, comply with:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

3.8 **GROUTING**

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.9 ACCESS DOORS – BUILDING

A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed HVAC equipment, dampers, valves, etc.

B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.10 FLASHING

A. Provide flexible flashing and metal counterflashing at roof curbs and where piping and ductwork penetrate weather or waterproofed walls, floors and roofs.

B. Provide curbs for mechanical roof installations 8-inches minimum height above finished roof surface. Flash and counter flash with sheet metal, seal watertight. Attach counterflashing to mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

C. Pipe Roof Penetrations: Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.11 DEDICATED ELECTRICAL SPACE

A. The space equal to the width and depth of the equipment and extending from the floor to a height of 6 feet above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in foreign systems. Every effort shall be made to eliminate foreign systems above equipment to the structural ceiling. If this is not possible, the Contractor shall encase any pipe in a second pipe with a minimum number of joints. Provide 18 gauge (minimum) galvanized, 4 inch (minimum) deep drain pans under piping and ductwork located or passing over electrical equipment. Pipe 1" drain from pan to nearest floor drain. Drain pan shall be adequately supported and constructed to hold 4 inches of water without collapse.

3.12 PROTECTION AND CLEANING OF EQUIPMENT AND MATERIALS

A. Comply with SMACNA "IAQ Guidelines for Occupied Buildings Under Construction," 2nd Edition 2007 (Chapters 3 and 4).

B. Equipment and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction. For equipment stored in the construction area, seal outlets on air handling units with 6-mil plastic sheeting. Stand-alone units (e.g. fan coil units, air terminal units, etc.) shall be wrapped with plastic and sealed with tape. Repair or replace damaged work, materials and equipment.

C. Take immediate measures to dry any equipment that becomes wet. If any mold growth develops on equipment due to becoming wet, remediate by following procedures approved by U.S. EPA (2001), "Mold Remediation in Schools and Commercial Buildings."

D. At completion of all work, thoroughly clean, exposed materials (duct, pipe, etc.) and equipment and make ready for painting.

E. Refer to Section 233113 "Metal Ducts", Part 3 Article "Duct Cleanliness."

END SECTION

SECTION 23 0062

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping ductwork and equipment:
1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Insulation couplings, strut-mounted.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.
8. Equipment roof supports.

1.2 RELATED SECTIONS

A. Division 23, Section “HVAC Systems Insulation”: Inserts, shields, and steel pipe saddles at hangers and supports for insulated piping systems.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-58.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:
1. Steel pipe hangers and supports.
2. Insulation couplings.
3. Pipe stands – factory fabricated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

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 Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:
1. Anvil International, Inc.
2. B-Line Systems, Inc.; a division of Cooper Industries.
3. Empire Industries, Inc.
4. ERICO/Michigan Hanger Co.
5. National Pipe Hanger Corporation.

6. PHD Manufacturing, Inc.

C. Coatings (All Components):
1. General Service Indoors: Electro-plated.
2. Exterior: Electro-plated or hot dipped galvanized.
3. Direct Contact with Copper Pipe: Provide non-metallic plastic coating or utilize copper hangers.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts to retain pipe.

B. Coatings (All Components):
1. Interior Dry Locations: Electro-plated.
2. Exterior and Wet Locations: Electro-plated or high performance factory applied electro deposition acrylic coating equal to Unistrut Perma-Green III; electro deposition epoxy coating equal to Cooper B-Line; or approved equivalent.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Unistrut Corp.; Tyco International, Ltd.

C. Coatings (All Components):
1. Interior Dry Locations: Electro-plated.
2. Exterior and Wet Locations: Electro-plated or high performance factory applied electro deposition acrylic coating equal to Unistrut Perma-Green III; electro deposition epoxy coating equal to Cooper B-Line; or approved equivalent.

2.5 INSULATION COUPLINGS, STRUT-MOUNTED

A. Description: One piece, tubular sleeve with an internal configuration that supports, secures, and seals tubular insulation and supports copper tubing without crushing the insulation.

B. Available Manufacturers:
1. Klo-Shure, Inc., Series 7.

C. General:
1. Manufactured from high strength TPO plastic suitable for indoor and outdoor use. Material to be UL 2043 classified for use in plenums.
2. ASTM E84 tested for a maximum 25/50 flame spread/smoke developed index.
3. For copper tubing 1/4 to 4-inch.
4. For preformed foamed plastic (elastomeric) and fiberglass insulation 1/2 to 1-1/2-inch wall thickness.
5. Insulation coupling creates a vapor barrier with no requirement for additional wrappings of insulation, tape, or glue.
6. Strut-mounted (Series 7) provided with coupling, clamp halves (with welded fastener and locknut).

D. Coatings (All Components):
1. Interior Dry Locations: Electro-plated.
2. Exterior and Wet Locations: Electro-plated or high performance factory applied electro deposition acrylic coating equal to Unistrut Perma-Green III; electro deposition epoxy coating equal to Cooper B-Line; or approved equivalent.

2.6 INSERTS

A. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. Anvil Figure 282.

2.7 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
2. Anchor rating to be at least 150% of hanger load rating.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Available Manufacturers:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
2. Anchor rating to be at least 150% of hanger load rating.

2.8 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support outdoor and roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
1. Available Manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Cooper B-Line: Dura-Block.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
1. Available Manufacturers:
   a. MIRO Industries.
   b. Cooper B-Line: Dura-Block.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
1. Available Manufacturers:
   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Portable Pipe Hangers.
   d. Cooper B-Line: Dura-Block.
2. Base: Plastic.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
1. Available Manufacturers:
   a. Portable Pipe Hangers.
   b. Cooper B-Line: Dura-Block.
2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary equipment roof support.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 EQUIPMENT ROOF SUPPORTS

A. Available Manufacturers:

1. The Pate Company: Model ES-5.

B. Fabrication: Welded, galvanized steel shell and base, gage as required for loads, minimum 18 gage, mitered 3-inch cant, variable step to match roof insulation, factory insulation, factory installed pressure treated wood nailer and counterflashing. Top of support shall be minimum 8-inches above roof surface.

2.11 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Use galvanized members and fasteners where installed outside, in fan plenums and areas of high humidity or condensation.
2. Provide other members with prime coat. Coat prior to installation.

B. Hanger Rods: Mild steel threaded both ends of continuous threaded with an electro-plated coating.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Provide foundations, supports, etc. not specified under other Divisions and as required to mount equipment in a workmanlike and structurally sound manner.

B. Comply with MSS SP-58 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Coatings:
1. Refer to respective Part 2 Article for coating requirements.

D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types: (Anvil Figure numbers are given for reference)
1. Provide copper clad or plastic coated hangers on bare copper lines.
2. Equipment pipe hanger with vibration isolators as specified under Division 23 “Vibration and Seismic Controls for HVAC Piping and Equipment.”
3. Pipe hangers for non-insulated piping 3-inch and smaller: Adjustable swivel ring (MSS Type 10), Anvil Figure No. 69 or adjustable clevis hanger (MSS Type 1) Anvil Figure No. 260.
4. Pipe hangers for insulated piping, all sizes (except for steam condensate, and hot water over 180 deg F): Adjustable, steel clevis hanger (MSS Type 1) Anvil Figure No. 260.
5. Pipe hangers for steam and condensate lines and hot water lines over 180 deg F: Adjustable swivel roller hanger (MSS Type 43), Anvil Figure No. 181.
6. Parallel piping graded in same direction may be grouped on trapezes.
7. Pipe stanchion saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

E. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8) Anvil Figure No. 261: For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

F. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
3. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18) Grinnell Figure No. 282: For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19) Grinnell Figure No. 92: For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

H. Comply with MSS SP-58 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

I. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-58. Provide and install hangers, supports, clamps, and building attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Fastener System Installation:
1. Use powder-actuated fasteners or mechanical-expansion anchors where inserts are omitted and in existing concrete construction.
2. Install powder-actuated fasteners and mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
3. Do not use powder-actuated fasteners in light weight concrete or concrete less than 4 inches thick.

F. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary equipment roof support.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following in accordance with Division 23, Section "HVAC Systems Insulation."
1. Provide insulation insert and shield at hanger and supports.
2. Provide steel pipe saddles at roller hangers and supports.

N. Insulation Couplings, Strut-Mounted; Insulated Copper Pipe:
1. All copper pipe and tubing (1/4 to 4-inch) supported by a strut style metal framing system shall be secured to the anchor channel with resilient insulation couplings with metal clamps.
2. When pipe is insulated with foamed plastic, apply adhesive to end of insulation prior to inserting into the coupling.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports as required to withstand wind load requirements per 2009 IBC Section 1609.

3.4 EQUIPMENT ROOF SUPPORTS

A. Provide equipment roof supports for roof mounted items as shown on drawings.

B. Anchor equipment roof supports to roof structure and anchor equipment to supports.

3.5 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods.

3.7 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Prime and paint all non-galvanized metal fabrication per the requirements of Division 9 "Painting."

3.8 SCHEDULES – PIPE HANGERS/SUPPORTS

A. Pipe Hanger/Support Spacing – Standard weight, steel pipe:

Pipe Size (Inches)	Maximum Hanger/Support Spacing (Feet)	Minimum Hanger Rod Diameter (Inches)
1/2 to 1-1/4	7	3/8
1-1/2	9	3/8
2	10	3/8
2-1/2	11	1/2
3	12	1/2
4	14	5/8
6	14	3/4
8	16	3/4
10	18	7/8
12	20	7/8
14	24	1
16	26	1
18	28	1
20	30	1-1/4
24	32	1-1/4
30	33	1-1/4

B. Pipe Hanger/Support Spacing – Type L, copper:

Pipe Size (Inches)	Maximum Hanger Spacing (Feet)	Minimum Hanger Rod Diameter (Inches)
1/4 to 3/4	5	3/8
1	6	3/8
1-1/4	7	3/8
1-1/2 to 2	8	3/8
2-1/2	9	1/2
3	10	1/2
4	12	1/2
6	14	5/8
8	16	3/4

C. Pipe Hanger/Support Spacing – Schedule 40 PVC (maximum operating temperature of 100 deg F):

Pipe Size (Inches)	Maximum Hanger Spacing (Feet)	Minimum Hanger Rod Diameter (Inches)
1/2 to 3/4	4	3/8
1	4-1/2	3/8
1-1/4 to 2	5	3/8

2-1/2 to 3	6	3/8
4	6-1/2	1/2
6	7-1/2	1/2
8	8	1/2

D. Pipe Hanger/Support Spacing – General:

1. Provide additional hangers or supports at concentrated loads such as flanges, valves, specialties, pumps, etc.
2. Provide a hanger or support within 12-inch of each change in direction for pipe sizes 1-1/2 NPS and smaller.
3. Rod size may be reduced one size for double rod hangers. Minimum rod diameter shall be 3/8-inch.
4. Schedule 40 PVC:
   a. For AC condensate drainage, use spacing for 100 deg F operating temperature.

END OF SECTION

SECTION 23 0077
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, including color and letter style.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, “Scheme for the Identification of Piping Systems,” for letter size, length of color field, colors, and viewing angles of identification devices for piping, unless otherwise noted herein.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. In existing buildings or facilities, coordinate pipe, valve and equipment labeling to match existing identification methodology, unless otherwise directed by the Architect.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.
2. Color Coding:

System	Background Color	Letters
Equipment served by emergency power	Red	White
Other equipment	Black	White

3. Temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.
5. Minimum Letter Size: Minimum ½-inch high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4-inch.

F. Minimum Letter Size: Minimum 1/2-inch high for viewing distances up to 72-inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information as indicated elsewhere in the Specifications and on the Drawings.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated on the Drawings. Abbreviate only as necessary for each application length.

B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to partially cover circumference of pipe on lines 6-inches outside diameter, including insulation, and smaller; Snap on, on lines over 6-inches outside diameter, including insulation, and secure with nylon straps.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on the Drawings and an arrow(s) indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions; or as a separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/4-inches high for 2-1/2-inch and larger pipe outside diameter, including insulation.

D. Following existing labeling color and format in existing buildings, unless otherwise directed by the Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of HVAC equipment.

B. Install or permanently fasten labels on starters furnished under this Division.

C. Locate equipment labels where accessible and visible.

3.3 WARNING-SIGNS AND LABELS INSTALLATION

A. Write required message on, and attach warning tags to equipment and other items where required in the specifications or shown on the Drawings.

B. Label access doors at fire and smoke dampers to read "FIRE DAMPER", "SMOKE DAMPER", or “COMBINATION FIRE/SMOKE DAMPER” respectively.

C. Provide warning sign at each disconnect switch served by a remotely located VFD to read: “TURN OFF POWER TO VFD WHEN DISCONNECT SWITCH IS IN OFF POSITION.”

D. Provide warning sign at each machinery room access door; prominently displayed, indicating the hazard classification of the refrigerant in accordance with NFPA 704.

3.4 PIPE LABEL INSTALLATION

A. Identify piping specified under this Division in accordance with ANSI/ASME A13.1.

B. Locate pipe labels where piping is exposed, or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows: **(Note: In finished spaces, obtain direction from Architect prior to installing pipe labels.)**
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. Near each change in direction.
5. At access doors, manholes, and similar access points that permit view of concealed piping.
6. Near major equipment items and other points of origination and termination.
7. Spaced at maximum intervals of 20 feet along each run.

C. Pipe Label Color Schedule:

Piping System	Background Color	Letter Color
Refrigerant	Green	White
Condensate	Green	White

END OF SECTION

SECTION 23 0183
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Refrigerant piping used for air-conditioning applications.
   2. Equipment drains and overflows.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a:
   1. Suction Lines for Air-Conditioning Applications: 115 psig.
   2. Suction Lines for Heat-Pump Applications: 225 psig.
   3. Hot-Gas and Liquid Lines: 225 psig.

B. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig.
   2. Suction Lines for Heat-Pump Applications: 535 psig.
   3. Hot-Gas and Liquid Lines: 535 psig.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
   1. Thermostatic expansion valves.
   2. Solenoid valves.
   3. Hot-gas bypass valves.
   4. Filter dryers.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
   1. Shop Drawing Scale: 1/8 inch equals 1 foot.
   2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.6 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.

2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range of 430 to 535 degrees F or
3. Joints: Copper or bronze pressure-seal fittings.

2.2 COPPER TUBE AND FITTINGS FOR REFRIGERANT PIPING

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8, Bag1, silver alloy.

2.3 VALVES AND SPECIALTIES

A. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

B. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and ac coil. Coordinate coil electrical requirements with Division 23, Section "HVAC Instrumentation and Controls."
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

C. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Superheat: Adjustable.
6. Reverse-flow option (for heat-pump applications).
7. End Connections: Socket, flare, or threaded union.
8. Working Pressure Rating: 450 psig.

2.4 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-134a: Tetrafluoroethane.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR ALL REFRIGERANT TYPES

A. Lines NPS 5/8 and Smaller: Copper, Type ACR, annealed-temper ("soft") tubing and wrought-copper fittings with brazed joints.

B. Lines NPS 3/4 and Larger: Copper, Type ACR, drawn-temper ("hard") tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

B. Install thermostatic expansion valves as close as possible to distributors on evaporators.
   1. Install valve so diaphragm case is warmer than bulb.
   2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
   3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

C. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

D. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

3.3 PIPING INSTALLATION

A. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to equipment to allow service and maintenance.

G. Install piping free of sags and bends.

H. Drawn-Temper Tubing: Install fittings for changes in direction.

I. Annealed-Temper (“soft”) Tubing: Make changes in directions greater than 30 degrees with pipe/conduit bending tool to avoid crimping of pipe.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Refer to Division 23 Sections "HVAC Instrumentation and Controls" for control wiring and sequence of operation.

L. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

M. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

N. Install refrigerant piping in protective conduit where installed belowground.

O. Slope refrigerant piping as follows:

P. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 07 Sections "Through-Penetration Firestop Systems" and “Fire-Resistive Joint Systems.”

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

A. Pipe joints to be constructed in accordance with the requirements of Division 23, Section “Basic HVAC Materials and Methods.”

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. For strut-mounted insulated piping, provide Insulation Couplings per the requirements of Division 23, Section “Hangers and Supports for HVAC Piping and Equipment.”

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately.
   a. Fill system with nitrogen to the required test pressure.
   b. System shall maintain test pressure at the manifold gage throughout duration of test.
   c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
   d. Remake leaking joints using new materials and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Motors mounted outdoors shall be TEFC. Provide motor end covers/shields, when exposed to direct rain.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: NEMA Premium efficient, as defined in NEMA MG 1 for all motors 1 horsepower and larger.

C. Service Factor: 1.15.

D. Multi-speed Motors: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Insulation: Class F.

H. Temperature Rise: Matching insulation rating.

I. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multi-Speed Drive: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by drive manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
   2. NEMA Premium-Efficient NEMA Motors, Inverter-Ready: Class B temperature rise; Class F insulation.
   3. Provide a shaft grounding ring. AEGIS SGR bearing protection ring by Electro Static Technology or approved equivalent.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application or as scheduled on the drawings:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run
   5. Electronically commutated.

B. Multi-speed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 0671
CONDENSING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes air-cooled condensing units.

1.2 SUBMITTALS

A. Product Data: For each condensing unit, include rated capacities, operating characteristics, furnished specialties, and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Shop Drawings: Signed and sealed by a qualified professional engineer.
   1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
   3. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Liquid and vapor pipe sizes.
   2. Refrigerant specialties.
   3. Piping including connections, oil traps, and double risers.
   4. Evaporators.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For condensing units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of condensing units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. 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.

C. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

1.4 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

C. Coordinate location of piping and electrical rough-ins.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Compressor failure.
      b. Condenser coil leak.
   2. Warranty Period: Five years from date of Substantial Completion.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONDENSING UNITS, AIR COOLED, 1 TO 5 TONS

A. Manufacturers:
1. Carrier Corporation; Carrier Air Conditioning Div.
2. Lennox Industries Inc.
3. Trane Co. (The); Worldwide Applied Systems Group.
4. Daikin
5. American Standard
6. Bryant

B. Description: Factory assembled and tested, consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

C. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.
1. Motor: Single speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
2. Two-Speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.
3. Accumulator: Suction tube.
4. Refrigerant Charge: R-410A

D. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.

E. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection.

F. Accessories:
1. Crankcase heater.
2. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
3. Evaporator Freeze Thermostat: Temperature-actuated switch that stops unit when evaporator reaches freezing temperature.
4. Filter-dryer.
5. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
6. Liquid-line solenoid.
7. Low Ambient Controller: Cycles condenser fan to permit operation down to 0 deg F with time-delay relay to bypass low-pressure switch.
8. Low Ambient Controller: Controls condenser fan speed to permit operation down to minus 20 deg F with time-delay relay to bypass low-pressure switch.
9. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
10. Sound Hood: Wraps around sound attenuation cover for compressor.
11. Thermostatic expansion valve.

G. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

2.3 CONDENSING UNITS, AIR COOLED, 6 TO 220 TONS

A. Manufacturers:
1. Carrier Corporation; Carrier Air Conditioning Div.
2. Lennox Industries Inc.
3. Trane Co. (The); Worldwide Applied Systems Group.
4. Daikin
5. American Standard
6. Bryant

B. Description: Factory assembled and tested, air cooled; consisting of casing, compressors, condenser coils, condenser fans and motors, and unit controls.

C. Condenser Coil: Seamless copper-tube, aluminum-fin coil, including subcooling circuit and backseating liquid-line service access valve. Factory pressure test coils, then dehydrate by drawing a vacuum and fill with a holding charge of nitrogen or refrigerant.

D. Condenser Fans: Propeller-type vertical discharge; directly driven. Include the following:
1. Permanently lubricated ball-bearing motors.
2. Separate motor for each fan.
3. Dynamically and statically balanced fan assemblies.

E. Operating and safety controls include the following:
1. Manual-reset, high-pressure cutout switches.
2. Automatic-reset, low-pressure cutout switches.
3. Low oil pressure cutout switch.
4. Compressor-winding thermostat cutout switch.
5. Three-leg, compressor-overload protection.
6. Control transformer.
7. Magnetic contactors for compressor and condenser fan motors.
8. Timer to prevent excessive compressor cycling.

F. Accessories:

1. Low Ambient Controller: Cycles condenser fan to permit operation down to 0 deg F with time-delay relay to bypass low-pressure switch.
2. Gage Panel: Package with refrigerant circuit suction and discharge gages.
3. Hot-gas bypass kit.
4. Part-winding-start timing relay, circuit breakers, and contactors.
5. Evaporator freeze thermostat.

G. Unit Casings: Designed for outdoor installation with weather protection for components and controls and with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include the following:
1. Steel, galvanized or zinc coated, for exposed casing surfaces; treated and finished with manufacturer's standard paint coating.
2. Perimeter base rail with forklift slots and lifting holes to facilitate rigging.
3. Gasketed control panel door.
4. Condenser coil hail guard grille to protect coil from physical damage.

2.4 MOTORS

A. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

2.5 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate the combination of the condensing units and evaporator coil according to **ARI 340/360**.
1. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
2. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

B. Test and inspect shell and tube condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of condensing units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where condensing units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Install roof-mounting units on equipment supports specified in Division 07.

C. Vibration Isolation: Mount condensing units on rubber pads with a minimum deflection of **1/4 inch**. Vibration isolation devices and installation requirements are specified in Division 23 Section "Mechanical Vibration and Seismic Controls."

D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

D. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 23 Section "Refrigerant Piping."

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Perform electrical test and visual and mechanical inspection.
   2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   5. Verify proper airflow over coils.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

C. Remove and replace malfunctioning condensing units and retest as specified above.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
   1. Inspect for physical damage to unit casing.
   2. Verify that access doors move freely and are weathertight.
   3. Clean units and inspect for construction debris.
   4. Verify that all bolts and screws are tight.
   5. Adjust vibration isolation and flexible connections.
   6. Verify that controls are connected and operational.

B. Lubricate bearings on fans.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

E. Verify proper operation of condenser capacity control device.

F. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Division 01 Section "Closeout Procedures or Demonstration and Training."

END OF SECTION

SECTION 23 0712
HVAC SYSTEMS INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. HVAC Piping Insulation.

B. HVAC Equipment Insulation.

C. Duct Insulation.

D. Jackets and Accessories.

1.2 RELATED SECTIONS

A. Section 230062 “Hangers and Supports for HVAC Piping and Equipment”: Insulation Couplings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory- and field- applied).
   1. Provide product description, list of materials and thickness for each service and location.
   2. For adhesives and sealants, documentation including printed statement of VOC content.
   3. Thermal-hanger inserts and shields.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data; For qualified installer.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing insulation work with minimum 3 years’ experience.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230062 “Hangers and Supports for HVAC Piping and Equipment.”

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate pipe insulation installation and testing of heat tracing.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 insulation application articles for where insulating materials shall be applied. Where more than one insulation material is specified for an application, Contractor may use any of the listed insulation materials for that application.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2 FOAMED PLASTIC PIPE INSULATION

A. Products: Subject to compliance with the requirements, provide one of the following:
   1. Armacell LLC; AP Armaflex AP; AP Armaflex FS (Flame Spread).
   2. Aeroflex USA; Aerocel.
   3. RBX Corporation; Insul-Tube 180.

B. Insulation: ASTM C534, Type 1; flexible, closed-cell, cellular elastomeric insulation, pre-slit or slip on.

1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
2. Minimum service temperature: -70 degrees F.
3. Maximum service temperature: 220 degrees F.
4. Moisture vapor absorption: ASTM D1056; 5.0 percent by weight.
5. Moisture vapor transmission: ASTM E96; 0.10 perm-inches.
6. Flame/Smoke Spread: ASTME E84; 20/50 Flame/Smoke.
7. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive:
1. Air dried adhesive, compatible with insulation.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Protective Coating/Jacket: Weather resistant, compatible with insulation or aluminum jacket as scheduled in Part 3- Execution.

E. Do not use indoors unless meets ASTM E-84 flame spread rating of less than 25 and smoke density rating of less than 50.

2.3 FOAMED PLASTIC EQUIPMENT AND EXTERNAL DUCT INSULATION

A. Products: Subject to compliance with the requirements, provide one of the following:
1. Armacell LLC; AP Armaflex; AP Armaflex FS.
2. Aeroflex USA Inc; Aerocel.
3. RBX Corporation; Insul-Sheet 1800.

B. Insulation: ASTM C534; flexible cellular elastomeric foam, sheet.
1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
2. Minimum service temperature: -40 degrees F.
3. Maximum service temperature: 220 degrees F.
4. Moisture vapor absorption: ASTM D1056; 5.0 percent by volume.
5. Moisture vapor transmission: ASTM E96; 0.10 perm-inches.
6. Connection: Waterproof vapor retarder adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

D. Protective Coating: Weather resistant, compatible with insulation.

E. Do not use in plenum unless meets ASTM E-84 flame spread rating of less than 25 and smoke density rating of less than 50.

2.4 FIELD-APPLIED JACKETS – PIPING AND EQUIPMENT

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket:
1. Manufacturers: Subject to compliance with the requirements, provide one of the following:
   a. Johns Manville; Zeston.
   b. P.I.C. Plastics; FG Series.
   c. Proto PVC Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.
2. Jacket: ASTM D1784, one-piece molded type fitting covers and sheet material.
   a. Minimum service temperature: 0 degrees F.
   b. Maximum service temperature: 150 degrees F.
   c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
   d. Thickness: 20 mil.
   e. Connections: Brush on welding adhesive.
   f. Color: Off-white, unless scheduled to be color coded.
3. Jacket Adhesive: As recommended by jacket material manufacturer.
   a. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

C. Metal Jacket:

1. Manufacturers: Subject to compliance with the requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum Jacketing.
   c. PABCO Metals Corp; Surefit.
   d. RPR Products, Inc.; Insul-Mate.
   e. VMSI.
2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   a. Factory cut and rolled to size.
   b. Thickness: 0.016-inch sheet.
   c. Finish: 3/16” corrugations.
   d. Joining: Longitudinal slip joints and 2-inch laps.
   e. Factory-Fabricated Fittings: 0.024-inch thick die shaped fitting covers with factory attached protective liner.
   f. Metal Jacket Bands: 3/8-inch-wide aluminum.
   g. Vapor Retarder Liner: 3-mil thick, bonded polysurin.
3. Factory-Fabricated Fitting Covers: Same material finish and thickness as jacket. Field fabricate fitting covers only if factory-fabricated not available.

2.5 GLASS FIBER, RIGID BOARD DUCT INSULATION

A. Products: Subject to compliance with the requirements, provide one of the following:
   1. Certainteed Corp; Commercial Board.
   2. Johns Manville; 800 Series Spin-Glass.
   3. Knauf Insulation; Insulation Glass Board.
   4. Mason Insulation; AK Board.
   5. Owens Corning; Fiberglass 700 Series.

B. Insulation: ASTM C612; rigid, noncombustible board.
   1. ‘K’ value: ASTM C518, 0.23 at 75 degrees F.
   2. Maximum service temperature: ASTM C411; 450 degrees F.
   3. Maximum moisture absorption: ASTM C1104; 5 percent by weight.
   4. Density: 6.0 lb/cu.ft.

C. Vapor Retarder Jacket:
   1. FSK: Glass-scrim reinforced laminate of aluminum foil and Kraft paper bound together.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm.

D. Indoor Vapor Retarder Mastic: Vinyl emulsion type acrylic, compatible with insulation, white color.

E. Board Fasteners: Galvanized steel impact-applied or welded mechanical fasteners with press-on heads.

2.6 GLASS FIBER DUCT LINER

A. Products: Subject to compliance with the requirements, provide one of the following:
   1. Certainteed Corp; ToughGuard.
   2. Mason Insulation; Akousti-Liner.
   3. Johns Manville.
   4. Knauf Insulation.
   5. Owens Corning.

B. Insulation: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."; flexible, noncombustible blanket with acrylic polymer meeting ASTM G21 impregnated surface and edge coat. Air side coating shall be black acrylic, containing an EPA registered antimicrobial agent.
   1. ‘K’ value: ASTM C177 or ASTM C518, maximum .28 at 75 degrees F mean temperature.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum velocity on coated air side: 5,000 fpm.
   4. Minimum noise reduction criteria: ASTM C1071; 0.45 for 1-inch thickness.
   5. Density: 1.5 lb/cu.ft.

6. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
   a. Fungi and Bacteria Resistance: No growth per ASTM E665, G21, and G22.

C. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2-inches in diameter.

D. Adhesive:
1. Waterproof, ASTM C196 fire-retardant type.
2. Comply with NFPA 90A or NFPA 90B and with ASTM C 916. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Liner Fasteners: Galvanized steel, impact applied or welded with integral or press-on head.

2.7 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Retarder Mastic: Water based; suitable for indoor and jacketed outdoor use on below ambient services.
1. Products:
   a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
   b. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
   b. Eagle Bridges - Marathon Industries; 501.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
   d. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
   b. Eagle Bridges - Marathon Industries; 570.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
2. Water-Vapor Permeance: ASTM F 1249,.05 perm 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
   b. Eagle Bridges - Marathon Industries; 550.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
   d. Mon-Eco Industries, Inc.; 55-50.
   e. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry. Chilled water pipe and equipment shall be at ambient temperature.
   3. Pressure and leak test all piping, ductwork and equipment and obtain review and acceptance prior to the application of insulation.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.3 INSTALLATION - GENERAL REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of the system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service.

D. Install insulation with longitudinal seams at top of horizontal runs.

E. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

F. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

G. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

H. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4-inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2-inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward cl-inching staples along edge at 2-inches o.c.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

I. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.
7. Flanges and unions

3.4 INSTALLATION – PIPING INSULATION GENERAL

A. Exposed Piping: Locate insulation and cover seams in least visible locations.

B. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

C. Fit pipe hangers over insulation.

D. Inserts and Shields:
1. Application: Protect insulated piping (other than steam, condensate and hot water above 180 deg F) at hangers and supports with insulation shield. On pipe sizes over 2-inches, provide insert.
2. Insulation Protection Shield: Galvanized steel formed in half circle to fit insulation. Length and gage as follow:
   a. Up to NPS 4: 12-inches long and 22-gauge.
   b. NPS 6: 18-inches long and 22-gauge.
   c. NPS 8 through 12: 24-inches long and 18-gauge.
   d. NPS 14 and larger: 24-inches long and 16-gauge.
3. Insulation-Insert Material: Water repellent treated, ASTM C533, Type I calcium silicate; or ASTM C552, Type II cellular glass of same thickness and vapor retarder jacket specified for surrounding insulation. Insert shall be a minimum of 2-inches longer than the shield.
4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
5. For Clevis Hangers: Insert shall cover lower 180 degrees of pipe.
6. Option: At Contractor’s option, insert may be factory fabricated Thermal Hanger Shield (insulation insert encased in sheet metal shield) equal to Pipe Shield, Inc. “Insulated Pipe Supports.”
7. Steel Pipe Saddles: 12-inch-long steel pipe saddle equal to Anvil Figs. 160-165. Tack weld saddles to pipe, fill interior void with insulation that matches adjoining insulation.
8. Option: At Contractor’s option, steel pipe saddle may be used on hot water pipe in lieu of insert and shield at hangers and supports.

E. Exterior Applications: Provide vapor retarder jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.5 FOAMED PLASTIC PIPE INSULATION APPLICATION

A. Pipe insulation may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected pipe.

B. Fabricate fittings from mitered sections of pipe insulation.

C. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Exterior Applications: Paint entire insulation with two coats of manufacturer’s approved weather-resistant protective finish, except where scheduled to have an aluminum jacket.

E. For strut-mounted copper piping (NPS 4 and smaller) systems, provide Insulation Couplings per the requirements of Section 230062 “Hangers and Supports for HVAC Piping and Equipment.”

3.6 FIELD-APPLIED JACKET APPLICATION

A. Aluminum Jacket:
1. Rivet jacketing in place and band with aluminum or stainless-steel bands 12-inches on center.
2. Finish fittings on aluminum jacketed lines with vinyl acrylic mastic reinforced with glass fab. Provide preformed aluminum insulation covers for outdoor fittings.
3. For exterior applications, locate jacket seams on bottom side of horizontal pipes and seal end joints with weatherproof sealant recommended by insulation manufacturer.

B. PVC Jackets:
1. Install with 1-inch overlap at longitudinal seams and end joints.
2. For horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels.
3. Seal with manufacturer’s recommended adhesive.
   a. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.7 SCHEDULES – PIPING INSULATION

A. General: Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Definitions:
1. Runouts: Runouts to individual terminal units not exceeding 4 feet long. Runouts exceeding 4 feet in length to be insulated same as mains.

C. HVAC Piping
1. Refrigerant Suction and Hot Gas Lines:
   a. Foamed Plastic Pipe Insulation
      1) NPS 1 and smaller: 1/2-inch thick.
      2) NPS 1-1/4 to 2: 3/4-inch thick.
      3) NPS 2-1/2 to 4: 1-inch thick.
      4) Jacket all lines exposed outdoors with aluminum jacket.
2. Refrigerant Liquid Lines on Mini Split System, Indoors and Outdoors Above Grade:
   a. Foamed Plastic Pipe Insulation, Indoors Above Grade:
      1) All pipe sizes: 1/2-inch thick.
      2) Jacket lines exposed outdoors with aluminum jacket. (Liquid and Suction lines can be wrapped together in a single aluminum jacket).
3. AC Unit Drain Lines, Indoors, Above Grade:
   a. Foamed Plastic Pipe Insulation
      1) All pipe sizes: 1/2-inch thick.

3.8 INSTALLATION – EQUIPMENT INSULATION GENERAL

A. Install in accordance with NAIMA Insulation Standards.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires or bands.

E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

G. Finish insulation at supports, protrusions, and interruptions.

H. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

I. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.9 INSTALLATION – DUCTWORK INSULATION GENERAL

A. General: Acceptable duct insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor retarder jackets.
   2. Seal all seams, punctures and tears with mastic. Do not use pressure sensitive tape.
   3. Continue insulation through non-rated walls, sleeves, hangers and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, exposed sleeves for fire and combination fire and smoke dampers, flexible connections, and expansion joints.

D. Insulated ductwork conveying air above ambient temperature:
   1. Provide with or without standard vapor retarder jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3.10 DUCT AND PLENUM LINER APPLICATION

A. Install duct liner in accordance with SMACNA "HVAC Duct Construction Standards."

B. Duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Apply liner with coated surface facing the air stream and adhere with 90 percent coverage of adhesive.

C. The liner shall be additionally secured with mechanical fasteners for ducts exceeding 8 -inches interior dimensions:

Velocity	Transversely Around Perimeter	Longitudinally
Up to 2500 FPM	At 4-inches from corners and at intervals not exceeding 12-inches.	At 3-inches from transverse joints and at intervals not exceeding 18 -inches.
From 2501 FPM to 6000 FPM	At 4-inches from corners and at intervals not exceeding 6 -inches.	At 3-inches from transverse joints and at intervals not exceeding 16 -inches.

D. All transverse joints shall have factory-applied edge coating and shall be neatly butted without gaps. Transverse joints, with shop-or field-cuts, shall be coated with adhesive approved by insulation manufacturer. At velocities over 2500 FPM (medium pressure supply air duct), all longitudinal joints shall be coated with adhesive.

E. All exposed leading edges facing the air stream at fan discharge, and at any interval of lined duct preceded by unlined duct, shall have factory-or field-applied edge coating. At velocities above 2500 FPM (medium pressure duct), provide metal nosing that is either channel or ZEE profile, or is integrally formed from the duct wall, securely installed over transversely oriented liner edges facing the air stream.

F. Seal all punctures, tears, or exposed edges at shop-or field-cuts with adhesive.

G. Duct dimensions shown on drawings are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.11 GLASS FIBER, EXTERNAL DUCT WRAP APPLICATION

A. Apply duct wrap to ducts pulled snug but not so tight as to compress corners more than ¼-inch.

B. Adjacent sections of duct wrap shall be tightly butted with 2-inch stapling flap overlapping. Seams shall be stapled approximately 6 -inches on center with ½ -inch minimum steel outward clinching staples. Seal all seams, punctures and tears with mastic. **Do not use pressure sensitive tape**.

C. Where rectangular or flat oval ducts are 24-inches width or greater, insulation shall be additionally secured to the bottom of the duct with mechanical fasteners spaced 18 -inches on center, not more than 3-inches from edge to prevent sagging. Seal fasteners with mastic.

D. Cover standing seams, stiffeners, and braces using same blanket insulation with 2-inch jacket lap, staples and mastic.

E. At fire dampers, smoke dampers and combination fire and smoke dampers, stop insulation at rated walls and externally insulate exposed sleeve on both sides of wall and seal insulation vapor tight to duct and wall.

F. Stop and point insulation around access and damper operators to allow operation without disturbing wrapping.

G. Lift ductwork off trapeze hangers and insert spacers.

3.12 GLASS FIBER, RIGID BOARD DUCT INSULATION APPLICATION

A. Apply board insulation to duct with mechanical fasteners located 12-inches on center. Seal all joints, fasteners, tears and punctures with glass cloth and mastic.

B. Cover standing seams, stiffeners and bracing with same insulation and seal vapor tight.

3.13 SCHEDULES – DUCT INSULATION

A. Common Duct Insulation Requirements:
1. Do not line supply duct connections to multi-zone AC units, or supply duct transitions to packaged air handlers, WSHP's, or other fan outlets less than 6 square feet outlet area. Insulate these transitions with 2-inch thick External Duct Wrap.
2. Conical and straight spin-in connections for round ducts at rectangular mains on both lined and externally insulated ducts: 2-inch thick External Duct Wrap. For low pressure ducts, split insulation at damper rod and seal vapor tight.
3. Fire, Smoke and Combination Fire and Smoke Dampers: On internally insulated ducts, stop duct liner at damper sleeve. Do not extend internal insulation through wall, partitions, or floor. Insulate portions of exposed damper sleeve, on both sides of the wall or floor, with 2-inch thick External Duct Wrap and seal insulation to duct and wall vapor tight.
4. Flexible Duct Connections on Indoor Insulated Duct Systems: 2-inch thick External Duct Wrap.
5. Duct exposed to view in finished spaces shall be factory insulated or insulated with duct liner.
6. Factory Insulated Duct: Field insulation not required unless otherwise noted.

B. Supply, return and outside air duct, including ducts connected to ERU's, exposed in Mechanical Room and not specified to be factory insulated or lined:
1. 2-inch thick Rigid Board External Duct Insulation with FSK jacket.
2. 2-inch thick External Duct Wrap.

C. Low Pressure Supply Ducts:
1. Rectangular Supply Duct, First 10 feet nearest AC unit: 1-inch thick Duct Liner.
2. All Sheet Metal Low Pressure Supply Duct Not Specified to be Lined or Otherwise Insulated: 2-inch thick External Duct Wrap.
3. Supply plenum mounted on top of supply diffusers: 2-inch thick External Duct Wrap.
4. Refer to paragraph below "Duct Exposed Outside" for insulation requirements on duct exposed outside.

D. Return Ducts:
1. Rectangular Return Ducts: 1-inch thick Duct Liner.
2. All Sheet Metal Return Duct Not Specified to be Lined or Otherwise Insulated: 2-inch thick External Duct Wrap.
3. Rectangular Transfer Ducts: 1-inch thick Duct Liner.
4. Refer to paragraph below "Duct Exposed Outside" for insulation requirements on duct exposed outside.

E. Ducts Serving Energy Recovery Units (ERU):
1. OSA Duct from Louver to ERU: 2-inch thick External Duct Wrap.
2. Exhaust Duct from ERU to Weather Louver: No insulation required.
3. Exhaust Duct from Building to ERU:
   a. Rectangular Duct, First 10 Feet Nearest ERU: 1-inch thick Duct Liner.
   b. Rectangular Runout from Main to Exhaust Grille: 1-inch thick Duct Liner, maximum 4-foot length.
4. Supply Duct from ERU to Building:
   a. All Sheet Metal Supply Duct Not Specified to be Lined or Otherwise Insulated: 2-inch thick External Duct Wrap.
5. Refer to paragraph below "Duct Exposed Outside" for insulation requirements on duct exposed outside.

F. Plenum at Weather Louvers:
1. Plenums Exposed in Mechanical Rooms, Etc.: 2-inch Rigid Board External Duct Insulation with FSK jacket.
2. Plenums Not Exposed: 2-inch thick External Duct Wrap.

G. Outside Air Ducts:
   1. All Sheet Metal Outside Air Duct Not Specified to be Otherwise Insulated: 2-inch thick External Duct Wrap.

H. General Exhaust Ducts:
   1. Rectangular Exhaust Ducts for Inline and Roof Mounted Fans, First 10 Feet Nearest Fan Intake: 1-inch thick Duct Liner.
   2. Exhaust Duct Between Ceiling Mounted or Inline Exhaust Fan and Building Exit Point (Weather louver, roof cap, brick vent, etc.): 2-inch thick External Duct Wrap.
   3. Rectangular Runouts from Main to Exhaust Grilles: 1-inch thick Duct Liner, maximum 4-foot length.

I. Plenum Enclosure Around Combustible Items:
   1. Fire Protection Duct Wrap: Thickness as required to provide combustibility requirements for combustible items installed in a ceiling return air plenum.
   2. Extent: As noted on Drawings.

END OF SECTION

SECTION 23 0732
ROOFTOP AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following rooftop units:
   1. Cooling and heating units 3 tons to 25 tons.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
   1. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
   2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Warranty: Special warranty specified in this Section.

C. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of RTU's and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1-2013, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1-2013, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. NFPA Compliance: Comply with NFPA 54 for gas-fired furnace section.

F. 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.

G. ARI Certification: Units shall be ARI certified and listed.

H. ARI Compliance for Units with Capacities Less Than 135,000 Btuh: Rate rooftop air-conditioner capacity according to ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment."
   1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

I. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."
   1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

1.4 COORDINATION

A. Coordinate size and location of roof curbs with roof framing.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Compressor Parts Only: Manufacturer's standard, but not less than five years from date of Substantial Completion.
   2. Warranty Period for Stainless Steel Heat Exchanger: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOFTOP AIR HANDLING UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Trane

2. Carrier Corp.
3. American Standard Companies, Inc.
4. Rheem
5. Daikin
6. Bryant

B. Casing: Manufacturer's standard galvanized sheet metal construction with exterior enamel paint finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 1/2 inch thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.

C. Indoor Fan: Forward curved, centrifugal, belt driven with adjustable motor sheaves, grease-lubricated ball bearings, and motor; or direct driven by multi-speed motor, (as scheduled). Mount fan and motor assembly on base with rubber isolators.

D. Outside Coil Fan: Propeller, directly driven by permanently lubricated motor.

E. Refrigerant Coils: Aluminum-plate fin and seamless copper tube in galvanized steel casing with equalizing-type vertical distributor and thermal expansion valve; tested to 450 psig and leak tested to 300 psig with air under water. Insulate coil section. Provide galvanized double slope drain pan under indoor coil.

F. Compressor(s): Hermetic, reciprocating or scroll, with integral vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater(s). Units 7-1/2 tons and larger to have minimum of two compressors.

G. Refrigeration Specialties:
1. Compressor(s).
2. Outside coil and fan.
3. Indoor coil and fan.
4. Check valves.
5. Expansion valves with replaceable thermostatic elements.
6. Compressor crankcase heater.
7. Refrigerant filter/dryer.
8. High-pressure safety switch.
9. Low-pressure safety switch.
10. Thermostats for evaporator coil freeze-up protection during low-ambient temperature operation, loss of air, or low refrigerant charge.
11. Independent refrigeration circuits for units 7-1/2 tons and larger.
12. Charge of refrigerant.
13. Refrigerant Circuits: Interlaced refrigerant-coil circuiting with circuit for each compressor.
14. Capacity Control: Compressor cycling with steps as scheduled.
15. Manual-reset compressor motor thermal overload.
16. Anti-recycling Time Device: Prevents compressor restart for five minutes after shutdown.
17. Low-Ambient, Head-Pressure Control: Designed to operate at temperatures to 0 deg F by cycling outside coil fans and controlling speed of last fan of each circuit.
18. Oil-Pressure Switch: Designed to shut down compressors on low oil pressure.

H. Filters: 2-inch thick, fiberglass, pleated, throwaway filters in filter rack.

I. Heat Exchanger: Tubular stainless-steel construction for natural gas fired burners (as scheduled) with the following controls:
1. Redundant dual gas valve with manual shutoff.
2. Stages of capacity as scheduled.
3. Direct-spark pilot ignition.
4. Electronic flame sensor.
5. Induced-draft blower with providing switch.
6. Flame rollout switch.

J. Economizer (provided where scheduled): Return- and outside-air dampers with neoprene seals, outside-air filter, and hood.
1. Damper Motor: Fully modulating spring return with adjustable minimum position.

2. Control: Electronic-control system uses outside-air dry bulb temperature or outside-air enthalpy (as scheduled) to adjust mixing dampers with minimum position setting.
3. Relief Damper: Gravity actuated with birdscreen and hood.

K. Outside Air Damper (for horizontal units): Linked blades, for 0-25% outside air, manual adjustment and hood.

L. Power Connection: Provide for single connection of power to unit with control-circuit transformer with built-in circuit breaker.

M. Unit Controls: Solid-state control board and components contain at least the following features:
1. Indoor fan on/off delay.
2. Default control to ensure proper operation after power interruption.
3. Unit diagnostics and diagnostic code storage.
4. Field-adjustable control parameters.
5. Dehumidification control with humidity sensor (where scheduled).
6. Economizer control.
7. Gas valve delay between first and second stage firing.
8. Indoor-air quality control with carbon dioxide sensor (where scheduled).
9. Low-ambient control, allowing operation down to 0 deg F.
10. Low refrigerant pressure control.
11. Demand-controlled ventilation control with remote CO_2 sensors.

N. Dehumidification Control (provide where scheduled):
1. Factory installed hot gas reheat to control humidity with reheat coil, solenoid valve humidity controller and remote mounted humidity sensor. Cooling or heating demand terminates dehumidification mode.

O. Optional Accessories (provide where scheduled):
1. Coil guard of painted, galvanized-steel wire.

P. Isolation Rail (provide where scheduled on drawings): Rigid upper and lower steel structure with vibration isolation springs having 2-inch static deflection and vertical and horizontal restraints; with elastomeric waterproof membrane.

2.2 MOTORS

A. Comply with requirements in Division 23 Section “Motors.”

B. Premium NEMA efficiency for belt drive, 3-phase motors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install unit level and plumb, maintaining manufacturer’s recommended clearances. Any slope must be toward side where condensate drain is connected.

B. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA’s “Low-Slope Membrane Roofing Construction Details Manual,” Illustration “Raised Curb Detail for Rooftop Air Handling Units and Ducts.” Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.

3.2 CONNECTIONS

A. Gas piping installation requirements are specified in Division 23 Sections.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 23 Section "Duct Accessories."

C. Electrical System Connections: Comply with applicable requirements in Division 26 for power wiring, switches and motor controls.

3.3 FIELD QUALITY CONTROL

A. Engage a manufacturer trained service technician shall perform the following quality-control tests and inspections to verify proper operation.
   1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
   2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and do the following:
   1. Inspect for visible damage to unit casing.
   2. Inspect for visible damage to furnace combustion chamber.
   3. Inspect for visible damage to compressor, coils, and fans.
   4. Inspect internal insulation.
   5. Verify that labels are clearly visible.
   6. Verify that clearances have been provided for servicing.
   7. Verify that controls are connected and operable.
   8. Verify that clean filters are installed.
   9. Clean condenser coil and inspect for construction debris.
   10. Adjust vibration isolators.
   11. Inspect operation of barometric relief dampers.
   12. Verify lubrication on fan and motor bearings.
   13. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
   14. Adjust fan belts to proper alignment and tension.
   15. Start unit according to manufacturer's written instructions.
   16. Inspect and record performance of interlocks and protective devices; verify sequences.
   17. Operate unit for an initial period as recommended or required by manufacturer.
   18. Adjust and inspect high-temperature limits.
   19. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
   20. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
   21. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

3.5 ADJUSTING

A. Adjust initial temperature, humidity, and CO_2 set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 0738
MINI SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes mini split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. 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.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

1.4 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Carrier Air Conditioning; Div. of Carrier Corporation.
   2. Daikin.
   3. Fujitsu General American, Inc.
   4. LG.
   5. Mitsubishi Electronics America, Inc.; HVAC Division.

2.2 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
   1. Insulation: Faced, glass-fiber duct liner.
   2. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motors: Comply with requirements in Division 23 Section "Motors."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Disposable Filters: 1 inch thick, in fiberboard frames.

F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Fan Motors: Comply with requirements in Division 23 Section "Motors."
1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable.

2.4 CEILING-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan and integral condensate pump.

D. Fan Motors: Comply with requirements in Division 23 Section "Motors."
1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable.

2.5 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
1. Compressor Type: Scroll.
2. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 10 deg F.

2.6 ACCESSORIES

A. Thermostat: Hard wired to remotely control compressor and evaporator fan, with the following features:
1. 24-hour time control of system stop and start.
2. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
3. Fan-speed selection, including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Anchor units to supports with removable, cadmium-plated fasteners.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment per Division 26 Section "Grounding and Bonding."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Closeout Procedures".

END OF SECTION

SECTION 23 0762
UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Drawings, elevations, sections, and details.
   2. Location and size of each field connection.
   3. Details of anchorages and attachments to structure and to supported equipment.
   4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
   5. Wiring Diagrams: Power, signal, and control wiring.
   6. Suspended ceiling components.
   7. Structural members to which unit heaters will be attached.
   8. Method of attaching hangers to building structure.
   9. Size and location of initial access modules for acoustical tile.
   10. Items penetrating finished ceiling, including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
   11. Perimeter moldings for exposed or partially exposed cabinets.

C. Samples for Verification: Finish colors for each type of cabinet unit heater and wall and ceiling heaters indicated with factory-applied color finishes.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For cabinet unit heaters 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, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 WALL AND CEILING HEATERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Markel or a comparable product by one of the following:
   1. Berko Electric Heating; a division of Marley Engineered Products.
   2. Chromalox, Inc.; a division of Emerson Electric Company.
   3. Indeeco.
   4. Marley Electric Heating; a division of Marley Engineered Products.

5. Ouellet Canada Inc.
6. QMark Electric Heating; a division of Marley Engineered Products.
7. Trane.

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:
1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.

F. Fan: Aluminum propeller directly connected to motor.
1. Motor: Permanently lubricated. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

G. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit.

H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

I. Capacities and Characteristics: Refer to schedule on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

B. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION

SECTION 23 0785
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

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. Packaged energy recovery units (roof-mounted with enthalpy wheel).
2. Indoor energy recovery units with energy core.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring 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 air-to-air energy recovery equipment to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Filters: One set of each type of filter specified.
2. Fan Belts: One set of belts for each belt-driven fan in energy recovery units.
3. Wheel Belts: One set of belts for each heat wheel.

1.7 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. ARI Compliance:
1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air- Cooling and Air-Heating Coils."

C. ASHRAE Compliance:
1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. UL Compliance:
1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.8 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Packaged Energy Recovery Units: 2 years.
   2. Warranty Period for Compressors: 5 years.
   3. Warranty Period for natural gas heat exchangers: 25 years.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. RenewAire LLC. (Basis of Design, ERV-2 and ERV-3)
   2. Greenheck Fan Corporation.
   3. Loren Cook Company.
   4. SEMCO Incorporated.
   5. Trane; American Standard Companies, Inc.
   6. Valent.
   7. Daikin.

B. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 1-inch thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
   a. Exhaust: Spring-return, motor-operated damper.
   b. Supply: Spring-return, motor-operated damper.

C. Heat Recovery Device: Fixed plate heat exchanger.

D. Supply and Exhaust Fans: Backward-curved SWSI, plenum centrifugal fan.
   1. Motor and Drive: Direct driven, electrically commutated
   2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
   3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

E. Extended-Surface, Disposable Panel Filters:
   1. Comply with NFPA 90A.
   2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
   3. Factory-fabricated, dry, extended-surface type.
   4. Thickness: 2 inches.
   5. Initial Resistance: Less than 0.29” wc at maximum airflow.
   6. Recommended Final Resistance: 1.0” wc above initial resistance.
   7. Minimum Arrestance: 90 according to ASHRAE 52.1.
   8. Minimum Merv: 8, according to ASHRAE 52.2.
   9. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
   10. Media-Grid Frame: Nonflammable cardboard.

11. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

F. Cooling Coils: Rated according to ARI 410 and ASHRAE 33**.**
1. Access: Fabricate coil section to allow removal and replacement of coil and to allow in-place access for service and maintenance of coil(s).
2. Casing: Galvanized steel.
3. Tubes: Copper.
4. Tube Headers: Copper.
5. Fins: Aluminum.
6. Fin and Tube Joint: Mechanical bond.
7. Leak Test: Coils shall be leak tested with air under water.
8. Refrigerant Coils:
   a. Capacity Reduction: Circuit coils for interleaved control.
   b. Suction and Distributor: Seamless copper tube with brazed joints.

G. Cooling-Coil Condensate Drain Pans:
1. Fabricated from stainless-steel sheet and sloped in multiple planes to collect and drain condensate from cooling coils, coil piping connections, coil headers, and return bends.
2. Complying with requirements in ASHRAE 62.1.
3. Drain Connections: At low point of pan with minimum 3/4" threaded nipple.
4. Units with stacked coils shall have an intermediate drain pan to collect and drain condensate from top coil.

H. Electrical Coils, Controls, and Accessories: Comply with UL 1995.
1. Casing Assembly: Flanged type with galvanized-steel frame.
2. Access: Fabricate coil section to allow removal and replacement of coil and to allow in-place access for service.
3. Open Heating Elements: Resistance wire of 60 percent nickel and 20 percent chromium, 20 percent iron supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame.
4. Overtemperature Protection: Disk-type, automatically resetting, thermal-cutout, safety device; serviceable through terminal box without removing heater from coil section.
5. Secondary Protection: Load-carrying, manually resetting or manually replaceable, thermal cutouts; factory wired in series with each heater stage.
6. Control Panel: Remote mounted with disconnecting means and overcurrent protection.
   a. Magnetic contactor.
   b. SCR controller.
   c. Toggle switches, one per step.
   d. Solid-state, stepless pulse controller.
   e. Time-delay relay.
   f. Pilot lights, one per step.
   g. Airflow proving switch.

I. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.
1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
3. Include nonfused disconnect switches.

J. Accessories:

1. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed-blade arrangement with steel operating rods rotating in bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.
2. Duct flanges.
3. Hinged access doors with quarter-turn latches.

4. Drain pans for condensate removal**.**
5. Automatic, in-place, spray-wash system.
6. Weatherproofing for tilt-control system.

2.2 PACKAGED ENERGY RECOVERY UNITS (with enthalpy wheel)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Trane; American Standard Companies, Inc. (Basis of Design, ERV-1)
2. RenewAire LLC.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. SEMCO Incorporated.
6. Valent.
7. Daikin.

B. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 2-inch thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
a. Exhaust: Gravity backdraft damper.
b. Supply: Spring-return, motor-operated damper.
2. Roof Curb: Refer to Division 7 Section "Roof Accessories" for roof curbs and equipment supports.

C. Energy Recovery Device: Enthalpy wheel.

D. Supply and Exhaust Fans: Backward-inclined, SWSI centrifugal fan with rubber vibration isolators.
1. Motor and Drive: Direct driven, VFD.
2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

E. Inlet Hood Filters: 2” thick aluminum mesh removable mis eliminators.

F. Disposable Panel Filters:
1. Comply with NFPA 90A.
2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, viscous-coated, flat-panel type.
4. Thickness: 2 inches.
5. Minimum Arrestance: 90 according to ASHRAE 52.1.
6. Minimum Merv: 8 , according to ASHRAE 52.2.
7. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
8. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

G. Cooling Coils: Rated according to ARI 410 and ASHRAE 33**.**
1. Access: Fabricate coil section to allow removal and replacement of coil and to allow in-place access for service and maintenance of coil(s).
2. Casing: Galvanized steel.
3. Tubes: Copper.
4. Tube Headers: Manufacturer's standard material.
5. Fins: Aluminum.
6. Fin and Tube Joint: Mechanical bond.
7. Leak Test: Coils shall be leak tested with air under water.
8. Refrigerant Coils:
a. Capacity Reduction: Circuit coils for interleaved control.
b. Suction and Distributor: Seamless copper tube with brazed joints.

H. Cooling-Coil Condensate Drain Pans:
1. Fabricated from stainless-steel sheet and sloped in multiple planes to collect and drain condensate from cooling coils, coil piping connections, coil headers, and return bends.
2. Complying with requirements in ASHRAE 62.1.
3. Drain Connections: At low point of pan with minimum 3/4" threaded nipple.
4. Units with stacked coils shall have an intermediate drain pan to collect and drain condensate from top coil.

I. Indirect-Fired Gas Furnaces:
1. Description: Factory assembled, piped, and wired; complying with NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."
a. AGA Approval: Furnace shall bear label of AGA.
2. Burners: Stainless steel.
a. Ignition: Electronically controlled electric spark with flame sensor.
3. Heat-Exchanger Drain Pan: Stainless steel.
4. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.
5. Gas Control Valve: Electronic modulating.
6. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff. Control devices and control sequence shall comply with requirements of FMG.
7. Access: Fabricate section to allow removal and replacement of furnace and to allow in-place access for service.

J. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.
1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
3. Include nonfused disconnect switches.

K. Accessories:
1. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed-blade arrangement with steel operating rods rotating in bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.
2. Duct flanges.
3. Rubber-in-shear isolators for ceiling-mounted units.
4. Hinged access doors with quarter-turn latches.
5. Drain pans for condensate removal**.**
6. Automatic, in-place, spray-wash system.
7. Weatherproofing for tilt-control system.

2.3 CAPACITIES AND CHARACTERISTICS (refer to equipment schedules on drawings)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixed-plate heat exchangers so supply and exhaust airstreams flow in opposite directions.

1. Install duct access doors in both supply and exhaust ducts, both upstream and downstream, for access to heat exchanger. Access doors and panels are specified in Division 23 Section "Duct Accessories."

B. Install gas-fired furnaces according to NFPA 54, "National Fuel Gas Code."

C. Install floor-mounted units on 8-inch- high concrete base.

D. Equipment Mounting: Install air-to-air energy recovery equipment on concrete bases. Comply with requirements for concrete bases specified in Division 3 Section "Cast-in-Place Concrete"
1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

E. Roof Curb: Install roof-mounted units on roof structure or concrete base, level and secure, according to The NRCA "Roofing and Waterproofing Manual - Volume 4: Construction Details - Low-Slope Roofing," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts. "Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 7 Section "Roof Accessories." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

F. Install units with clearances for service and maintenance.

G. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

H. Pipe drains from drain pans to nearest floor drain; use ASTM B 88, Type L, drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Connect piping to units mounted on vibration isolators with flexible connectors.

D. Connect cooling condensate drain pans with air seal trap at connection to drain pan and install cleanouts at changes in pipe direction.

E. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping."

F. Gas Piping: Comply with requirements in Division 23 Section Facility Natural-Gas Piping. Connect gas piping with shutoff valve and union and with sufficient clearance for burner removal and service. Make connection with AGA-approved flexible connectors.

G. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."

H. Indirect-Fired Furnace Vent Connections: Comply with Division 23 Section "Breechings, Chimneys, and Stacks."

I. Electrical Connections: Comply with applicable requirements in Division 26 Sections.
1. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:
1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Adjust seals and purge.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Set initial temperature and humidity set points.
5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION

SECTION 23 0820
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backdraft dampers.
2. Barometric and pressure relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Ceiling radiation dampers.
6. Smoke dampers.
7. Combination fire and smoke dampers.
8. Flange connectors.
9. Turning vanes.
10. Flexible connectors.
11. Flexible ducts.
12. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For each type of product included in this section.
1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include drawings, elevations, sections, details and attachments to other work.
1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.4 COORDINATION

A. Coordinate size, quantity, type and locations of automatic dampers with Division 23, Section “Instrumentation and Control for HVAC.”

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

E. Galvanized dampers specified below: Use equivalent stainless steel dampers in stainless steel ducts and aluminum dampers in aluminum ducts constructed per SMACNA standards.

2.2 BACKDRAFT DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Nailor Industries Inc.
7. NCA Manufacturing, Inc.
8. Ruskin Company.
9. SEMCO Incorporated.
10. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 3000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: 0.125-inch-thick extruded aluminum, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, maximum 6-inch width, 0.070-inch- thick, extruded aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:
1. Material: Metallic.
2. Diameter: 0.75 inch.

J. Tie Bars and Brackets: Galvanized steel.

K. Bearings: Synthetic sleeve type.

Sleeve: Minimum 20-gauge thickness.

2.3 MANUAL VOLUME DAMPERS - STANDARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Greenheck: MBD-10, MBD-15, MBDR-50.
4. McGill AirFlow LLC.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Ruskin Company: MD-25, MD-35, MDRS-25.
8. Vent Products Company, Inc.

B. Standard leakage rating, with linkage concealed in frame.

C. Suitable for horizontal or vertical applications.

D. Galvanized dampers specified below: Use equivalent stainless steel dampers in stainless steel ducts and aluminum dampers in aluminum ducts constructed per SMACNA standards.

E. Dampers up to 36x12 inches with a maximum velocity of 1500 fpm (457m/min)
1. Basis of Design: Ruskin MD25.
2. Frames:

a. Hat-shaped, galvanized steel channels, 22 gauge minimum thickness.
b. Mitered and welded corners.
c. Flangeless frames for installing in ducts.

3. Blades:
a. Single blade.
b. Stiffen damper blades for stability.
c. Galvanized steel, 22 gauge thick.

4. Blade Axles: Galvanized steel.
5. Bearings:
a. Molded synthetic.
6. Tie Bars and Brackets: Galvanized steel.
7. Actuator: Locking hand quadrant with ½ inch round or 3/8 inch square shaft.

F. Dampers up to 48x48 inches with maximum velocity = 1500 fpm.
1. Basis of Design: Ruskin MD35.
2. Frames:
a. Hat-shaped, galvanized steel channels, 20 gauge minimum thickness.
b. Mitered and welded corners.
c. Flangeless frames for installing in ducts.

3. Blades:
a. Multiple blade.
b. Opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized steel 16 gauge thick.

4. Blade Axles: Galvanized steel.
5. Linkage: Concealed in frame.
6. Bearings:
a. Molded synthetic.
7. Tie Bars and Brackets: Galvanized steel.
8. Actuator: Locking hand quadrant for ½ inch round shaft.

G. Dampers up to 16 inches diameter with a maximum velocity of 1500 fpm
1. Basis of Design: Ruskin MDRS25.
2. Frames:
a. Galvanized steel, 20 gauge minimum thickness.
b. Roll formed with stiffener beads each end.
c. Flangeless frames for installing in ducts.

3. Blades:
a. Butterfly type.
b. Stiffen damper blades for stability.
c. Galvanized steel 20 gauge thick.

4. Blade Axles: Galvanized steel.
5. Bearings:
a. Molded synthetic.
6. Actuator: Locking hand quadrant for ½ inch round or 3/8 inch for square shaft.

H. Accessories:
1. Hand Quadrant Standoff Bracket: 2 inch standoff for externally insulated ductwork.

2.4 CONCEALED REMOTE CABLE CONTROL FOR MANUAL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Young Regulator Co.
2. Approved equal

B. Basis of Design: Young Regulator Co., model 270-301.

C. 2-5/8” die cast cup to be embedded in gypsum board with 3” cover plate.

D. 14 ga. galvanized steel rack and pinion design.

E. Maximum cable length: 50 feet.

F. Dampers with 1/2" round or 3/8” square shafts: Option 270-301B.

G. Dampers with 5/16" round or 1/4” square shafts: Option 270-301B-Q.

H. Accessories:
1. 030-12 wrench.
2. BCW – Bowden Casing and Wire – ordered separately by the foot or in bulk.
3. Directional arrows to indicate blade positioning.
4. Cover plate as coordinated with architect.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Nailor Industries Inc.
7. NCA Manufacturing, Inc.
8. Ruskin Company.
9. Vent Products Company, Inc.
10. Young Regulator Company.

B. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:
1. Angle shaped.
2. Galvanized-steel channels, 0.064 inch thick.
3. Mitered and welded corners.

D. Blades:
1. Multiple blade with maximum blade width of 8 inches.
2. Parallel- and opposed-blade design.
3. Galvanized-steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:
1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Ruskin Company.

B. General Requirements:

1. Label according to UL 555S.
2. Leakage:
   a. Class 1 for medium pressure supply duct systems.
   b. Class 2 for low pressure duct systems and velocity less than 1500 fpm
3. Elevated Temperature Rating: 250 deg F.
4. Air Flow Velocity: 2000 fpm and 3000 fpm for medium pressure supply duct systems.
5. Pressure Rating: 4 in w.g.

C. Construction:
1. Frame: 5 inch x 16 gauge roll formed galvanized steel hat-shaped channel, reinforced at corners.
2. Blades: Low pressure duct system with maximum velocity of 1500 fpm
   a. Basis of Design: Ruskin SD36
   b. Style: Single skin with 3 longitudinal grooves.
   c. Action: Opposed blade.
   d. Material: 6-inch wide, 16 gauge galvanized steel.
3. Blades: For medium pressure supply ducts, or velocities exceeding 1500 fpm
   a. Basis of Design: Ruskin SD60.
   b. Style: Airfoil shaped, single piece, double skin.
   c. Action: Opposed blade.
   d. Material: 6-inch wide, 16 gauge galvanized steel.
4. Seals:
   a. Blade: Inflatable silicone fiberglass mechanically attached to blade edge.
   b. Jamb: Stainless steel, flexible metal compression type.
5. Linkage: Concealed in frame.
6. Axles: Minimum ½ inch diameter, mechanically attached to blade.
7. Mounting: Horizontal or vertical, as shown on the Drawings.
8. Actuator:
   a. Manufacturers: Belimo with no equals.
   b. Electric 120V or 24V, 60 Hz, two-position, fail close. Coordinate voltage requirements with Division 26 and fire alarm system.
   c. External mounting except behind grilles in shaft walls.
   d. Internal auxiliary end switch that closes when damper is 85 percent open.

D. Accessories:
1. Smoke Detector: Integral, factory wired for single point connection. Photoelectric type.

E. Factory Sleeve:
1. Minimum thickness: Per U.L. Listing installation requirements.
2. Length to suit wall application, minimum 17 inches
3. Silicone caulk factory applied to sleeve at damper.

F. True Round: Up to 16 inch diameter.
1. Basis of Design: Ruskin SDR25.
2. Sleeve with integral mounting / clinch plates for mounting in square wall opening.
3. Blade: Butterfly type.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Ruskin Company.

B. General Requirements:
1. Label according to U.L. 555S.
2. Fire Resistance – 1-1/2 hour unless noted on Drawings to be 3 hour.
3. Leakage:
   a. Class 1 for medium pressure supply duct systems.

b. Class 2 for low pressure duct systems and velocity less than 1500 fpm
c. Elevated Temperature Rating: 250 deg F.

4. Air Flow Velocity: 2000 fpm for low pressure duct and 3000 fpm for medium pressure supply duct systems.
5. Pressure Rating: 4 in w.g.

C. Construction:
1. Frame: 5 inch x 16 gauge roll formed galvanized steel hat-shaped channel, reinforced at corners.
2. Blades for low pressure ducts with velocities less than 1500 fpm.
a. Basis of Design: Ruskin FSD36.
b. Style: Single skin with 3 longitudinal grooves.
c. Action: Opposed blade.
d. Material: 6-inch wide, 16 gauge galvanized steel.
3. Blades: For medium pressure supply ducts, or velocities exceeding 1500 fpm
a. Basis of Design: Ruskin FSD60.
b. Style: Airfoil shaped, single piece, double skin.
c. Action: Opposed blade.
d. Material: 6-inch wide, galvanized steel.
4. Seals:
a. Blade: Inflatable silicone fiberglass mechanically attached to blade edge.
b. Jamb: Stainless steel, flexible metal compression type.
5. Linkage: Concealed in frame.
6. Axles: Minimum ½ inch diameter, mechanically attached to blade.
7. Mounting: Horizontal or vertical, as shown on the Drawings.
8. Actuator:
a. Electric 120V or 24V, 60 Hz, two-position, fail close. Coordinate voltage requirements with HVAC controls and Division 26 drawings.
b. External mounting except behind grilles in shaft walls.
c. Internal auxiliary end switch that close when damper is 85 percent open.

D. Heat-Responsive Device: Re-useable, manual resettable, temperature sensing link, open at 165 deg F.

E. True Round: Up to 16 inch diameter.
1. Basis of Design: Ruskin FSDR25.
2. Sleeve with integral mounting / clinch plates for mounting in square wall opening.
3. Blade: Butterfly type.

F. Accessories:
1. Smoke Detector: Integral, factory wired for single point connection. Photoelectric type.

G. Factory Sleeve:
1. Minimum thickness: Per U.L. Listing installation requirements.
2. Length to suit wall application, minimum 17 inch
3. Silicone caulk factory applied to sleeve at damper.

2.8 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ruskin Company.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gauge and Shape: Match connecting ductwork.

2.9 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. METALAIRE, Inc.
   4. SEMCO Incorporated.
   5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 18 inches high or maximum velocity of 1500 fpm and double wall for larger dimensions or velocities and all medium pressure supply duct.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Ventfabrics, Inc.
   4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd.
   2. Tensile Strength: 480 lbf/inch in the wrap and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
   1. Minimum Weight: 24 oz./sq. yd.
   2. Tensile Strength: 530 lbf/inch in the wrap and 440 lbf/inch in the filling.
   3. Service Temperature: Minus 50 to plus 250 deg F.

G. Electrical Grounding
   1. Install braided copper jumpers around all flexible connectors.

2.11 FLEXIBLE DUCTS

A. Insulated Flexible Duct, Low Pressure: Installed Downstream Low Pressure AC Units.
   1. Manufacturers:
      a. Atco Rubber Products; 30 Series.
      b. Flexmaster: Type 5 (Basis of Design).
      c. Technaflex: WK.
      d. Thermaflex: M-KE.
   2. UL 181, Class 1, trilaminate of aluminum foil, fiberglass and aluminized polyester mechanically locked (no adhesives) to a helically wound galvanized steel wire, fiberglass insulation, black polyethylene vapor-barrier.
   3. Vapor Barrier Permeance: 0.1 perm per ASTM E96, procedure A.
   4. Pressure rating: 6 inch WG positive and 4 inch WG through 16 inch diameter.
   5. Temperature Range: Minus 20 to plus 210 deg F.
   6. Thermal Performance: R-value not less than 4.2 per ASTM C-518.

B. Spin-Ins: Branch Duct Connectors for Connecting Round Low Pressure Duct to Rectangular Low Pressure Duct:

1. Manufactures:
   a. Flexmaster: FLD (Basis of Design)
2. Galvanized steel G-90 minimum 26 gauge.

C. Side Takeoff Fitting: Rectangular Inlet with Round Outlet for Connecting Round Low Pressure Duct to Rectangular Low Pressure Duct.
1. Manufacturers:
   a. Flexmaster: STOD/B03. (Basis of Design)
2. Galvanized steel, G-90 minimum 26 gauge.

D. Flexible Duct Clamps: Make Connections Between Flexible and Other Duct or Equipment with Duct Clamps:
1. High and Medium Pressure (Upstream of Air Terminal Units): Stainless steel band with cadmium plated hex screw to tighten band with a worm gear action and duct sealer.
2. Low Pressure: Nylon strap, above accessible ceilings. Provide stainless steel band with cadmium plated hex screw to tighten band with a worm gear action above inaccessible ceilings. Use stainless steel band above non-accessible ceilings.

E. Connect diffusers to low-pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install duct test holes where required for testing and balancing purposes.

3.2 DAMPERS

A. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

B. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.
3. Install stainless volume dampers in stainless ducts.

C. Set dampers to fully open position before testing, adjusting, and balancing. Saw mark end of shaft parallel with damper blade.

D. Install fire and smoke dampers according to UL listing.

3.3 DUCT ACCESS DOORS

A. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
1. On both sides of duct coils.
2. Downstream from control dampers.
3. Adjacent to and close enough to fire or smoke dampers, combination smoke and fire dampers, and ceiling radiation dampers to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
4. Upstream of air flow monitors (AFM).

5. Elsewhere as indicated.

B. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

C. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

3.4 FLEXIBLE CONNECTORS

A. Install flexible connectors at all duct connections to all fans, all AC units and all fan powered air terminal units.

B. Install flexible connectors in all ducts at building expansion joints.

C. Electrical Grounding: Install braided copper jumpers around all flexible connections, taking care that jumpers do not bind flexes.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 0838
POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Ceiling-mounted ventilators.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on project site conditions.

B. Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material gages and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. For high plume and laboratory exhaust fans: Provide nozzle velocity of exhaust fan, total exhaust flow and discharge plume rise at 10 mph cross wind velocity.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 01.

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. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

C. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating." Label fans with the AMCA – Certified Rating Seal.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

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. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

2.2 CEILING-MOUNTING VENTILATORS

A. Manufacturers:
   1. Cook, Loren Company.
   2. Greenheck.
   3. Approved equal.

B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

C. Housing: Steel, lined with acoustical insulation. Provide horizontal inlet and horizontal discharge configuration for cabinet fans.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Grille: Plastic or aluminum, louvered or Egg Crate grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories: Provide as scheduled on the drawings.
   1. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
   2. Motion Sensor: Motion detector with adjustable shutoff timer.
   3. Filter: Washable aluminum to fit between fan and grille.
   4. Isolation: Rubber-in-shear vibration isolators.

2.3 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Guarded drip proof.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Electrically ground all equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Equipment Startup Checks:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Verify lubrication for bearings and other moving parts.
6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
7. Disable automatic temperature-control operators.

B. Starting Procedures:
1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

END OF SECTION

SECTION 23 0855
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers / Grilles.

C. Weather Louvers.

1.2 SUBMITTALS

A. Submit under provisions of Section 230010.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.3 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 062 and ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS - GENERAL

A. Acceptable Manufacturer's:
1. Titus.
2. Metal Air.
3. Kreuger.
4. Carnes.
5. Price.
6. Tuttle & Bailey.

B. Coordinate / verify border and frame types for ceiling air devices are shown on Architectural Reflective Ceiling Plan.

C. Equip all ceiling mounted air devices with ceiling radiation dampers and thermal blankets.

2.2 RECTANGULAR LOUVERED FACE CEILING DIFFUSER (LD, SD)

A. Manufacturer's:
1. Titus Model TDC: Steel construction.

B. Type: Square and rectangular, multi-louvered diffuser to discharge air in one way, two way, three way, or four way pattern as scheduled with square neck.

C. Border:
1. LD – Inverted T-bar, 24x24 inch ceiling module;
2. SD – Surface mounted, dripped beveled.

D. Fabrication: Steel with baked white anodic acrylic paint finish.

2.3 ROUND CEILING DIFFUSER, HEAVY DUTY (RD)

A. Manufacturer:
1. Titus Model XL-310.

B. Type: Heavy Duty round adjustable (horizontal to vertical) pattern multi-core diffuser designed to discharge air in 360 degree pattern and round neck. Discharge airflow pattern field adjustable by rotation ring operator.

C. Fabrication: 18 gauge steel with white baked anodic acrylic paint finish.

D. Accessories: Radial opposed blade damper adjustable by removing inner core.

2.4 ROUND CEILING DIFFUSER (RCD)

A. Manufacturers:

1. Titus Model TMR.
2. Other acceptable manufacturers offering equivalent products.

B. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern.

C. Fabrication: Steel with white baked anodic acrylic paint finish.

D. Accessories: Radial opposed blade damper louvered face adjustable from diffuser face, safety chain and foam gasket.

2.5 WALL SUPPLY REGISTERS (SR)

A. Manufacturers:
1. Titus Model 300F.

B. Type: Individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with friction pivots to set blades, vertical face, double deflection.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

D. Fabrication: Aluminum with factory white baked anodic acrylic paint finish.

E. Damper: Integral, gang-operated opposed blade type operable from face.

2.6 CEILING EGGCRATE EXHAUST, RETURN AND TRANSFER REGISTERS/GRILLES (E,R,T)

A. Manufacturers:
1. Titus Model 50F.

B. Type: Fixed grilles of 1/2 x 1/2 inch eggcrate.

C. Border:
1. Neck sizes up to 12x12 inch, 1-1/4 inch margin with countersunk screw mounting, with plaster frame.
2. Neck size 14x14 inch and larger, lay in frame.

D. Fabrication: All aluminum with factory white anodic acrylic finish. Provide steel border when scheduled to be equipped with ceiling radiation damper.

E. Damper: Integral, gang-operated, opposed blade type operable from face. Omit damper on transfer grilles (T) and non-ducted return grilles.

2.7 WALL EXHAUST AND RETURN REGISTERS/GRILLES (WER,WRR/WEG,WRG)

A. Manufacturers:
1. Titus Model 355ZR.

B. Type: Fixed blades, 3/4 inch minimum depth, 3/8 inch spacing, zero degree deflection, with blades, horizontal.

C. Frame: 1-1/4 inch margin with countersunk screw mounting.

D. Fabrication: Steel with 16 gauge minimum frames and 14 gauge minimum blades, with factory white baked anodic acrylic paint finish.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face. No damper on grilles (WEG, WRG, WTG).

2.8 CEILING EXHAUST AND RETURN REGISTERS/GRILLES (WER, WRR, WEG,WRG)

A. Manufactures:
1. Titus Model 350F.

B. Type: Fixed blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 35 degrees horizontal face.

C. Border: 1-1/4 inch margin with countersunk screw mounting and plaster frame.

D. Fabrication: Aluminum extrusions with factory white baked anodic acrylic paint finish.

E. Damper: Integral, gang-operated, opposed blade type, operable from face. Omit damper on grilles (WEG, WRG).

2.9 WEATHER LOUVERS

A. Manufacturers:
1. Greenheck Model ESD-603.

2. Other acceptable manufacturers offering equivalent products.
   a. Ruskin.
   b. Airolite.
   c. Construction Specialties.

B. Type: 6 inch deep with stationary blades on 45 degree slope with integral gutter on each jamb shall incorporate an integral downspout, heavy channel frame.

C. Fabrication: 12 gauge thick extruded aluminum, welded assembly, with factory 3 coat kynar 500 fluoropolymer spray finish, color to be selected by architect.

D. Mounting: Furnish with exterior channel frame for installation.

E. Accessories: Removable, rear mounted, 1/2" mesh aluminum birdscreen; extended sill finished to match louver.

F. Performance: 4'x4' unit: Free area = 8.53 sq.ft. (53%); at an intake 1,250 FPM free area velocity static pressure drop not exceeding 0.26" water gauge and water penetration not exceeding 0.01 ounces of water per sq.ft.

2.10 GRAVITY ROOF VENTS

A. Manufacturers:
   1. Greenheck Model GRS.
   2. Other acceptable manufacturers offering equivalent products.
      a. Cook.
      b. ACME.

B. Fabrication: Spun aluminum ventilator with birdscreen and integral curb cap. Minimum 20 gauge 12 inch high roof curb with pressure treated wood nailer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. Check location of outlet and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangements.

C. Install diffusers to ductwork with airtight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099100.

F. Ceiling mounted air devices connected with flexible duct shall be secured to prevent falling if grid shifts.

G. Weather Louvers:
   1. Blank unused portion of louvers with sandwich of 1 inch duct liner with 26 gauge galvanized steel inner and outer panels. Fasten blanks to indoor side of louvers with sheet metal screws and seal with duct sealer.
   2. Duct and plenum connections to louvers should be sloped to the louvers to prevent moisture from entering the ductwork and equipment. Refer to louver details on Drawings.

END OF SECTION

SECTION 23 0900
HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

1.2 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. MS/TP: Master slave/token passing.

D. PC: Personal computer.

E. PID: Proportional plus integral plus derivative.

F. RTD: Resistance temperature detector.

1.3 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:
   1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
   2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
   3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
   4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
   5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
   6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
   7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
   8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
      a. Space Temperature: Plus or minus 1 deg F.
      b. Ducted Air Temperature: Plus or minus 1 deg F.
      c. Outside Air Temperature: Plus or minus 2 deg F.
      d. Dew Point Temperature: Plus or minus 3 deg F.
      e. Temperature Differential: Plus or minus 0.25 deg F.
      f. Relative Humidity: Plus or minus 5 percent.
      g. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
      h. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
      i. Airflow (Terminal): Plus or minus 10 percent of full scale.
      j. Air Pressure (Space): Plus or minus 0.01-inch wg.
      k. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
      l. Carbon Monoxide: Plus or minus 5 percent of reading.
      m. Carbon Dioxide: Plus or minus 50 ppm.
      n. Electrical: Plus or minus 5 percent of reading.

1.4 SEQUENCE OF OPERATION

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. Refer to drawings for control sequences.

1.5 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
   1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
   2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
   3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
   2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
   3. Wiring Diagrams: Power, signal, and control wiring.
   4. Details of control panel faces, including controls, instruments, and labeling.
   5. Written description of sequence of operation.
   6. Schedule of dampers including size, leakage, and flow characteristics.
   7. Schedule of valves including flow characteristics.
   8. DDC System Hardware:
      a. Wiring diagrams for control units with termination numbers.
      b. Schematic diagrams and drawings for field sensors and control hardware.
      c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
   9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
   10. Controlled Systems:
      a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
      b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
      c. Written description of sequence of operation including schematic diagram.
      d. Points list.

C. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

D. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.

E. Samples for Verification: For each color required, of each type of thermostat or sensor cover.

F. Software and Firmware Operational Documentation: Include the following:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.
   5. Software license required by and installed for DDC workstations and control systems.

G. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

H. Qualification Data: For installer and manufacturer.

I. Field quality-control test reports.

J. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
   2. Interconnection wiring diagrams with identified and numbered system components and devices.
   3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
   4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
   5. Calibration records and list of set points.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. 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.

C. Comply with ASHRAE 135 for DDC system components.

1.7 DELIVERY, STORAGE, AND HANDLING

A. System Software: Update to latest version of software at Project completion.

1.8 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with drawings and room details before installation.

B. Coordinate equipment with Division 28 Section "Intrusion Detection" to achieve compatibility with equipment that interfaces with that system and with building master clock.

C. Coordinate equipment with Division 28 Section "Security Access" to achieve compatibility with equipment that interfaces with that system.

D. Coordinate equipment with Division 28 Section "Clock and Program Control" to achieve compatibility with equipment that interfaces with that system.

E. Coordinate equipment with Division 28 Section "Detention Monitoring and Control (PLC Based)" to achieve compatibility with equipment that interfaces with that system.

F. Coordinate equipment with Division 28 Section "Lighting Controls" to achieve compatibility with equipment that interfaces with that system.

G. Coordinate equipment with Division 28 Section "Fire Alarm" to achieve compatibility with equipment that interfaces with that system.

H. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

I. Coordinate equipment with Division 26 Section "Electrical Power Monitoring and Control" to achieve compatibility of communication interfaces.

J. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

K. Coordinate equipment with Division 26 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

L. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

1.9 EXTRA MATERIALS

A. Furnish extra materials described below if allowed by project that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Replacement Materials: One replacement diaphragm or relay mechanism for each unique damper motor, valve motor, controller, thermostat, positioning relay.
   2. Maintenance Materials: One thermostat adjusting key(s).

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 Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONTROL SYSTEM

A. Available Manufacturers:
   1. Trane; Worldwide Applied Systems Group (Basis of design)
   2. Automated Logic Corporation.
   3. Honeywell International Inc.; Home & Building Control.
   4. Johnson Controls, Inc.; Controls Group.
   5. KMC Controls/Kreuter Manufacturing Company.
   6. Siemens Building Technologies, Inc.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

C. Control system shall include the following:
   1. Building intrusion detection system specified in Division 28 Section "Intrusion Detection."
   2. Building clock control system specified in Division 28 Section "Clock and Program Control."
   3. Building lighting control system specified in Division 28 Section "Lighting Controls."
   4. Fire alarm system specified in Division 28 Section "Fire Alarm."

2.3 DDC EQUIPMENT

A. Operator Workstation: One PC-based microcomputer(s) with minimum configuration as follows:
   1. Motherboard: With 8 integrated USB 2.0 ports, integrated Intel Pro 10/100 (Ethernet), integrated audio, bios, and hardware monitoring.
   2. Processor: Intel Pentium 4
   3. Random-Access Memory: 512 MB.
   4. Graphics: Video adapter, minimum 1600 x 1200 pixels, 64 MB video memory, with TV out.
   5. Monitor: 17 inches, LCD color.
   6. Keyboard: QWERTY, 105 keys in ergonomic shape.
   7. Floppy-Disk Drive:
   8. Hard-Disk Drive: 500 GB .
   9. CD-ROM Read/Write Drive: 48x24x48.
   10. Mouse: Three button, optical.
   11. Uninterruptible Power Supply: 350 kVa.
   12. Operating System: Microsoft Windows XP Professional with high-speed Internet access.
      a. ASHRAE 135 Compliance: Workstation shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
   13. Printer: Color, ink-jet type as follows:
      a. Print Head: 4800 x 1200 dpi optimized color resolution.
      b. Paper Handling: Minimum of 100sheets.
      c. Print Speed: Minimum of 17ppm in black and 12ppm in color.
   14. Application Software:
      a. I/O capability from operator station.
      b. System security for each operator via software password and access levels.
      c. Automatic system diagnostics; monitor system and report failures.
      d. Database creation and support.
      e. Automatic and manual database save and restore.
      f. Dynamic color graphic displays with up to 10 screen displays at once.

g. Custom graphics generation and graphics library of HVAC equipment and symbols.
h. Alarm processing, messages, and reactions.
i. Trend logs retrievable in spreadsheets and database programs.
j. Alarm and event processing.
k. Object and property status and control.
l. Automatic restart of field equipment on restoration of power.
m. Data collection, reports, and logs. Include standard reports for the following:
1) Current values of all objects.
2) Current alarm summary.
3) Disabled objects.
4) Alarm lockout objects.
5) Logs.
n. Custom report development.
o. Utility and weather reports.
p. Workstation application editors for controllers and schedules.
q. Maintenance management.

15. Custom Application Software:
a. English language oriented.
b. Full-screen character editor/programming environment.
c. Allow development of independently executing program modules with debugging/simulation capability.
d. Support conditional statements.
e. Support floating-point arithmetic with mathematic functions.
f. Contains predefined time variables.

B. Diagnostic Terminal Unit: Portable notebook-style, PC-based microcomputer terminal capable of accessing system data by connecting to system network with minimum configuration as follows:
1. System: With one integrated USB 2.0 port, integrated Intel Pro 10/100 (Ethernet), integrated audio, bios, and hardware monitoring.
2. Processor: Intel Pentium 4
3. Random-Access Memory: 128MB.
4. Graphics: Video adapter, minimum 1024 x 768 pixels, 64 MB video memory.
5. Monitor: 17 inches, LCD color.
6. Keyboard: QWERTY 105 keys in ergonomic shape.
7. Floppy-Disk Drive: 1.44 MB.
8. Hard-Disk Drive: 800 MB.
9. CD-ROM Read/Write Drive: 48x24x48.
10. Pointing Device: Touch pad or other internal device.

C. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.
1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
a. Global communications.
b. Discrete/digital, analog, and pulse I/O.
c. Monitoring, controlling, or addressing data points.
d. Software applications, scheduling, and alarm processing.
e. Testing and developing control algorithms without disrupting field hardware and controlled environment.
3. Standard Application Programs:
a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.

b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
c. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.
d. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.
e. Remote communications.
f. Maintenance management.
g. Units of Measure: Inch-pound and SI (metric).

4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
5. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

D. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.
1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
a. Global communications.
b. Discrete/digital, analog, and pulse I/O.
c. Monitoring, controlling, or addressing data points.
3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

E. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

F. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:
1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

G. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:
1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.
   1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
   2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
   3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
   4. Indoor enclosure: Dustproof rated for operation at 32 to 120 deg F.
   5. Outdoor enclosure: Waterproof rated for operation at 40 to 150 deg F.

2.5 ALARM PANELS

A. Unitized cabinet with suitable brackets for wall or floor mounting. Fabricate of 0.06-inch- thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish. Provide common keying for all panels.

B. Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted on hinged cover.
   1. Alarm Condition: Indicating light flashes and horn sounds.
   2. Acknowledge Switch: Horn is silent and indicating light is steady.
   3. Second Alarm: Horn sounds and indicating light is steady.
   4. Alarm Condition Cleared: System is reset and indicating light is extinguished.
   5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.6 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.
   1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

E. Receiver Controllers: Single- or multiple-input models with control-point adjustment, direct or reverse acting with mechanical set-point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.
   1. Remote-control-point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 psig.
   2. Proportional band shall extend from 2 to 20 percent for 5 psig.
   3. Authority shall be 20 to 200 percent.
   4. Air-supply pressure of 18 psig, input signal of 3 to 15 psig, and output signal of zero to supply pressure.
   5. Gages: 3-1/2 inches in diameter, 2.5 percent wide-scale accuracy, and range to match transmitter input or output pressure.

2.7 TIME CLOCKS

A. Available Manufacturers:
   1. ATC-Diversified Electronics.

2. Grasslin Controls Corporation.
3. Paragon Electric Co., Inc.
4. Precision Multiple Controls, Inc.
5. SSAC Inc.; ABB USA.
6. TCS/Basys Controls.
7. Theben AG - Lumilite Control Technology, Inc.
8. Time Mark Corporation.

B. Solid-state, programmable time control with 4 separate programs each with up to 100 on-off operations; 1-second resolution; lithium battery backup; keyboard interface and manual override; individual on-off-auto switches for each program; 365-day calendar with 20 programmable holidays; choice of fail-safe operation for each program; system fault alarm; and communications package allowing networking of time controls and programming from PC.

2.8 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:
1. Available Manufacturers:
   a. BEC Controls Corporation.
   b. Ebtron, Inc.
   c. Heat-Timer Corporation.
   d. I.T.M. Instruments Inc.
   e. MAMAC Systems, Inc.
   f. RDF Corporation.
2. Accuracy: Plus or minus 0.5 deg F at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft..
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. RTDs and Transmitters:
1. Accuracy: Plus or minus 0.2 percent at calibration point.
2. Wire: Twisted, shielded-pair cable.
3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
4. Averaging Elements in Ducts: 18 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
5. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
6. Room Sensor Cover Construction: Manufacturer's standard locking covers.
7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

D. Humidity Sensors: Bulk polymer sensor element.
1. Accuracy: 2 percent full range with linear output.
2. Room Sensor Range: 20 to 80 percent relative humidity.
3. Room Sensor Cover Construction: Manufacturer's standard locking covers.
4. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
5. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of minus 22 to plus 185 deg F.
6. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:

1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
   a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA.
   c. Building Static-Pressure Range: 0- to 0.25-inch wg.
   d. Duct Static-Pressure Range: 0- to 5-inch wg.
2. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
3. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
4. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
5. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

F. Room Sensor Cover Construction: Manufacturer's standard locking covers.

G. Room sensor accessories include the following:
1. Insulating Bases: For sensors located on exterior walls.
2. Guards: Locking; heavy-duty, transparent plastic; mounted on separate base
3. Adjusting Key: As required for calibration and cover screws.

2.9 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.

B. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

C. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

D. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

E. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

F. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

2.10 FLOW MEASURING STATIONS

A. Duct Airflow Station: Combination of air straightener and multiport, self-averaging pitot tube station.
1. Casing: Galvanized-steel frame.
2. Flow Straightener: Aluminum honeycomb, 3/4-inch parallel cell, 3 inches deep.
3. Sensing Manifold: Copper manifold with bullet-nosed static pressure sensors positioned on equal area basis.

2.11 THERMOSTATS

A. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.
1. Label switches “FAN ON-OFF".
2. Mount on single electric switch box.

B. Electric, solid-state, microcomputer-based room thermostat with remote sensor.
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set up for four separate temperatures per day.
4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
5. Short-cycle protection.
6. Programming based on weekday, Saturday, and Sunday.

7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
8. Battery replacement without program loss.
9. Thermostat display features include the following:
    a. Time of day.
    b. Actual room temperature.
    c. Programmed temperature.
    d. Programmed time.
    e. Duration of timed override.
    f. Day of week.
    g. System mode indications include "heating," "off," "fan auto," and "fan on."

C. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

D. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.
1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

E. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.
1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

F. Fire-Protection Thermostats: Listed and labeled by an NRTL acceptable to authorities having jurisdiction; with fixed or adjustable settings to operate at not less than 75 deg F above normal maximum operating temperature, and the following:
1. Reset: Manual.

G. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

H. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable set point in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

I. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.
1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

J. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.
1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

K. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

2.12 HUMIDISTATS

A. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.13 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
   1. Comply with requirements in Division 23 Section "Motors."
   2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
   3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
   4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
   5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
   6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
   1. Valves: Size for torque required for valve close off at maximum pump differential pressure.
   2. Dampers: Size for running torque calculated as follows:
      a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
      b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
      c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
      d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
      e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
      f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
   3. Coupling: V-bolt and V-shaped, toothed cradle.
   4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
   5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
   6. Power Requirements (Two-Position Spring Return): 24-V ac.
   7. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
   8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
   9. Temperature Rating: Minus 22 to plus 122 deg F.
   10. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
   11. Run Time: 12 seconds open, 5 seconds closed.

2.14 DAMPERS

A. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.
   1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
   2. Operating Temperature Range: From minus 40 to plus 200 deg F.
   3. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.15 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 26 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.
   1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install guards on thermostats in the following locations:
   1. Entrances.
   2. Public areas.
   3. Where indicated.

E. Install automatic dampers according to Division 23 Section "Duct Accessories."

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Install labels and nameplates to identify control components according to Division 23 Section "Mechanical Identification."

H. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

I. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

J. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

K. Install electronic and fiber-optic cables according to Division 26 Section "Voice and Data Communication Cabling."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
   2. Test and adjust controls and safeties.
   3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
   4. Test each point through its full operating range to verify that safety and operating control set points are as required.
   5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
   6. Test each system for compliance with sequence of operation.
   7. Test software and hardware interlocks.

C. DDC Verification:
   1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
   2. Check instruments for proper location and accessibility.
   3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
   4. Check instrument tubing for proper fittings, slope, material, and support.
   5. Check installation of air supply for each instrument.
   6. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.

7. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
8. Check temperature instruments and material and length of sensing elements.
9. Check control valves. Verify that they are in correct direction.
10. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
11. Check DDC system as follows:
    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.4 ADJUSTING

A. Calibrating and Adjusting:
1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:
    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
5. Flow:
    a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
    b. Manually operate flow switches to verify that they make or break contact.
6. Pressure:
    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
7. Temperature:
    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.
8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 23 0950
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1. SUMMARY

A. This Section includes TAB to produce design objectives for the following:
   1. Air Systems.
   2. Duct mounted smoke detectors.
   3. Duct leakage tests
   4. Existing systems TAB
   5. Verifying that automatic control devices are functioning properly.
   6. Reporting results of activities and procedures specified in this Section.

1.2. DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. Smoke-Control System: An engineered system that uses fans to produce airflow and pressure differences across barriers to limit smoke movement.

F. Smoke-Control Zone: A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke-control system.

G. Stair Pressurization System: A type of smoke-control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.

H. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

I. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

J. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

K. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

L. TAB: Testing, adjusting, and balancing.

M. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

1.3. SUBMITTALS

A. Qualification Data: Submit evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article and below.

B. Sample Report Forms: Submit sample TAB report forms.

C. Certified TAB Reports: Submit three copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.4. QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use TAB firm's forms approved by Architect.

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.
1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5. PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6. COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

C. Coordinate the efforts of others (General Contractor, HVAC installers, electrical subs, etc.) to allow the supply diffusers and return grilles in the Gymnasium/Basketball courts to be proportionally balanced prior to the point where diffusers/grilles are not accessible due to height, finished floors, pews, etc.

D. Coordinate all TAB work through the contract schedule. Certified TAB reports are required one month prior to Substantial Completion to allow thorough review. The Certified TAB report must be approved by the Owner, Engineer and Commissioning Firm (if applicable) before the project can receive Substantial Completion.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine approved submittal data of HVAC systems and equipment.

B. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

C. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

D. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

E. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

F. Examine plenum ceilings used for return air to verify that they are airtight with no openings to the exterior.

G. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

H. Examine equipment for installation and for properly operating safety interlocks and controls.

I. Examine automatic temperature system components to verify the following:
1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multi-zone units, mixing boxes, and variable-air-volume terminals.
4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
5. Sensors are located to sense only the intended conditions.

6. Sequence of operation for control modes is according to the Contract Documents.
7. Controller set points are set at indicated values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to indicated values.

J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Verify that motor starters are equipped with properly sized thermal protection.

D. Check dampers for proper position to achieve desired airflow path.

E. Check for airflow blockages.

F. Check for proper sealing of air-handling unit components.

G. Check for proper sealing of air duct system.

3.4 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
   2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
      a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
   3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Recommend corrective action to align design and actual conditions.
   4. Make required adjustments to pulley sizes to accommodate fan-speed changes.
   5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
2. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.5 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.6 PROCEDURES FOR HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:
1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.

B. Refrigerant Coils: Measure the following data for each coil:
1. Airflow.
2. Air pressure drop.

3.7 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or non-grounded power supply.

J. Note operation of electric actuators using spring return for proper fail-safe operations.

3.8 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 to minus 10 percent.
   2. Air Outlets and Inlets: Plus 10 to minus 10 percent.

3.9 REPORTING

A. Status Reports: As work progresses, prepare reports to describe deficiencies and problems found in systems being tested and balanced.

3.10 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, bound, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed by the certified testing and balancing Agent.
   1. Include a list of instruments used for procedures, along with proof of calibration.

C. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of TAB firm.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of TAB firm who certifies the report.
   10. Table of Contents.
   11. Summary of contents including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from Contract Documents.
   12. Nomenclature sheets for each item of equipment.
   13. Data for terminal units, including manufacturer, type and size.
   14. Notes to explain why certain final data in the body of reports varies from indicated values.
   15. Test conditions for fans and pump performance forms including the following:
      a. Settings for outside-, return-, and exhaust-air dampers.
      b. Conditions of filters.
      c. Face and bypass damper settings at coils.
      d. Fan drive settings including settings and percentage of maximum pitch diameter.
      e. Settings for supply-air, static-pressure controller.
      f. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
   1. Quantities of outside, supply, return, and exhaust airflows.
   2. Terminal units.
   3. Balancing stations.

E. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
   1. Unit Data: Include the following:
      a. Unit identification.
      b. Location.
      c. Make and type.
      d. Model number and unit size.
      e. Manufacturer's serial number.
      f. Sheave make, size in inches, and bore.
      g. Sheave dimensions, center-to-center, and amount of adjustments in inches.

h. Number of belts, make, and size.
i. Number of filters, type, and size.

2. Motor Data:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Filter static-pressure differential in inches wg.
   f. Preheat coil static-pressure differential in inches wg.
   g. Cooling coil static-pressure differential in inches wg.
   h. Heating coil static-pressure differential in inches wg.
   i. Outside airflow in cfm.
   j. Return airflow in cfm.

F. Apparatus-Coil Test Reports:

1. Coil Data:
   a. System identification.
   b. Location.
   c. Coil type.

2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Air pressure drop in inches wg.
   c. Return-air, wet- and dry-bulb temperatures in deg F.
   d. Entering-air, wet- and dry-bulb temperatures in deg F.
   e. Leaving-air, wet- and dry-bulb temperatures in deg F.
   f. Water flow rate in gpm.
   g. Water pressure differential in feet of head or psig.
   h. Entering-water temperature in deg F.
   i. Leaving-water temperature in deg F.

G. Gas-Fired Heat Apparatus Test Reports:

1. Unit Data:
   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Motor horsepower and rpm.
   g. Motor volts, phase, and hertz.
   h. Motor full-load amperage and service factor.
   i. Sheave make, size in inches, and bore.
   j. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Entering-air temperature in deg F.
   c. Leaving-air temperature in deg F.
   d. Entering-air static pressure in inches wg.
   e. Leaving-air static pressure in inches wg.
   f. Motor voltage at each connection.

g. Motor amperage for each phase.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data:
   a. System identification.
   b. Location.
   c. Coil identification.
2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Entering-air temperature in deg F.
   c. Leaving-air temperature in deg F.
   d. Voltage at each connection.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
   a. System identification.
   b. Location.
2. Motor Data:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
   g. Number of belts, make, and size.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Suction static pressure in inches wg.

J. Round, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
   a. System and air-handling unit number.
   b. Location and zone.
   c. Duct static pressure in inches wg.
   d. Duct size in inches.
   e. Duct area in sq. ft.
   f. Indicated airflow rate in cfm.
   g. Indicated velocity in fpm.
   h. Actual airflow rate in cfm.
   i. Actual average velocity in fpm.

K. Air-to-Air Heat-Recovery Unit Reports:
1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model and serial numbers.
2. Motor Data:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full load amperage and service factor.

e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. If fans are an integral part of the unit, include the following for each fan:
   a. Make and type.
   b. Arrangement and size.
   c. Sheave make, size in inches, and bore.
   d. Sheave dimensions, center-to-center, and amount of adjustments in inches.
4. Test Data (Indicated and Actual Values):
   a. Total exhaust airflow rate in cfm.
   b. Outside airflow rate in cfm.
   c. Total exhaust fan static pressure in inches wg.
   d. Total outside-air fan static pressure in inches wg.
   e. Pressure drop on each side of recovery wheel in inches wg.
   f. Exhaust air temperature entering in deg F.
   g. Exhaust air temperature leaving in deg F.
   h. Outside-air temperature entering in deg F.
   i. Outside-air temperature leaving in deg F.

L. Instrument Calibration Reports:
1. Report Data:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of calibration.

3.11 INSPECTIONS

A. Before final acceptance of the Tab Report:
1. Owner or Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
2. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
3. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
4. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
5. Request a second final inspection.

END OF SECTION

SECTION 23 3113
METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
   1. Sheet metal materials.
   2. Single-wall rectangular ducts and fittings.
   3. Single-wall round ducts and fittings.
   4. Double-wall round ducts and fittings.
   5. Sealants and gaskets.
   6. Hangers and supports.

1.2 RELATED SECTIONS

A. Section 230077 “Identification for HVAC Piping and Equipment” for labeling requirements for fire dampers, smoke dampers and duct access doors.

B. Section 230950 “Testing, Adjusting and Balancing” for testing, adjusting, and balancing for metal ducts.

C. Section 230712 “HVAC Systems Insulation” for duct liner requirements.

D. Section 230820 “Duct Accessories” for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Sealants and gaskets.

B. Shop Drawings: Drawn to 1/4-inch equals 1-foot scale.
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory-and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, seal classification, and static-pressure classes.
   4. Elevation of bottom of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through smoke barriers and fire-rated construction.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including access doors and dampers.
   12. Hangers and supports, including methods for duct and building attachment.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to a scale large enough to indicate and resolve conflicts, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services including:
      a. Suspended ceiling components.
      b. Other systems installed in same space as duct.

c. Ceiling and wall mounting access doors and panels required to provide access to dampers and other operating devices.
d. Ceiling mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

2. Indicate proposed changes to duct layout.
3. Provide Coordination Drawings for all areas within the Mechanical scope of work of the associated drawings.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections, including pitting, dents and other imperfections including those which would impair post painting.

C. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: "Paint Grip" steel - Mill phosphatized or galvanealed.

D. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized where installed on galvanized sheet metal ducts.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 900 mm 36 inches.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Duct sizes shown on the Drawings are clear inside dimensions without an allowance for insulation.

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eastern Sheetmetal.
2. Linx Industries, Inc.
3. McGill AirFlow LLC.
4. SEMCO Incorporated.
5. Sheet Metal Connectors, Inc.
6. Spiral Systems., Inc.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Transverse Joints in Duct Larger than 60 Inches in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Fabricate elbows using die-formed, gored, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter unless noted otherwise on drawings. Unless elbow construction type is indicated, fabricate elbows as follows:
1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," Table 3-1 "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments unless otherwise indicated.
a. Elbows 12-inches and Smaller in Diameter: Stamped.
b. Elbows 14-inches and Larger in Diameter: Welded

2.4 DOUBLE-WALL ROUND DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eastern Sheetmetal.
2. Linx Industries, Inc.
3. McGill AirFlow LLC.
4. SEMCO Incorporated.
5. Sheet Metal Connectors, Inc.
6. Spiral Systems., Inc.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, “Round, Oval, and Flexible Duct,” based on indicated static-pressure class unless otherwise indicated.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
   2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Fabricate elbows using die-formed, gored, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter unless noted otherwise on Drawings. Unless elbow construction type is indicated, fabricate elbows as follows:
   1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," Table 3-1 "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments unless otherwise indicated.
      a. Elbows 12-inches and Smaller in Diameter: Stamped.
      b. Elbows 14-inches and Larger in Diameter: Welded

G. Interstitial Insulation: Mat faced fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
   1. Thickness:
      a. Supply Air Ducts: 1-inch thick
      b. Return Air Ducts: 1-inch thick
      c. Exhaust Air Ducts: 1-inch thick
   2. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature (R4).
   3. Maintain concentricity of inner duct to outer shell by mechanical means. Prevent dislocation of insulation by mechanical means.
   4. Coat insulation with antimicrobial coating.

H. Inner Duct:
   1. Duct: Minimum 0.028-inch solid sheet steel with 3/32-inch holes on 3/16-inch staggered centers for a free area of 23%.
   2. Fittings: 0.028-inch solid sheet steel.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.
   3. Shore A Hardness: Minimum 20.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. VOC: Maximum 75 g/L (less water).
   7. Maximum Static-Pressure Class: 10-inch wg, Plus and Minus.
   8. Service: Indoor or outdoor.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Base: Synthetic rubber resin.
   3. Solvent: Toluene and heptane.
   4. Solids Content: Minimum 60 percent.

5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L (less water).
10. Maximum Static-Pressure Class: 10-inch wg, Plus and Minus.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant:
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of0.14 L/s per sq. m at 250 Pa 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, Plus or Minus.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel all-thread rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum, or galvanized steel coated with zinc chromate.

H. Refer to Section 230062 “Hangers and Supports for HVAC Piping and Equipment,” for additional requirements.

PART 3 - EXECUTION

3.1 DUCT CLEANLINESS

A. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines" and the following:
1. Delivery to Site:
a. Prevent damage during transportation and off-loading
b. All duct shall be sealed either by blanking or capping duct ends, bagging small fittings, surface wrapping or shrink wrapping.

2. The area provided for storage shall be clean, dry and exposure to dust minimized. Cover duct stored on construction site with 6 mil plastic.
3. Installation:
   a. Work area shall be clean, dry, and protected from the elements.
   b. Internal surface of uninsulated duct shall be wiped immediately prior to installation.
   c. Open ends on completed work and overnight work-in-progress shall be sealed.
4. Replace internal duct liner that gets wet.

3.2 DUCT INSTALLATION - GENERAL

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts with fewest possible joints.

D. Install factory or shop-fabricated fittings for changes in direction, size, and shape and for connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a minimum clearance of 1-inch, plus allowance for insulation thickness.

H. Route to avoid passing through transformer vaults, electrical equipment rooms and enclosures, data closets and elevator machine rooms.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Where ducts pass through fire-rated interior partitions and exterior walls or smoke barriers, install fire dampers, smoke dampers or combination fire and smoke dampers as required. Comply with requirements in Section 230820 “Duct Accessories” for fire and smoke dampers.

3.3 EXPOSED DUCTWORK - ADDITIONAL INSTALLATION REQUIREMENTS

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.4 HANGERS AND SUPPORTS INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports.”

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 100 mm4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1M Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 1200 mm48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports or as shown on the Drawings.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to air handlers and fans with flexible connectors complying with Section 230820 “Duct Accessories.”

B. Make connections to air terminal units as shown on the drawings.

C. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in Part 3 "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible.”

B. Seal Classes:
1. Seal Class A: Seal all transverse joints, longitudinal seams, and duct wall penetrations.
2. Seal Class B: Seal all transverse joints and longitudinal seams.
3. Seal Class C: Seal all transverse joints.

C. All connections shall be sealed under all Seal Classes, including but not limited to spin-ins, taps, other branch connections, access doors, access panels, and duct connections to equipment. Sealing that would void product listings is not required. Spiral lock seams need not be sealed.

D. Seal ducts and perform leak tests (where scheduled in Part 3, Article “Field Quality Control below”) prior to concealment of any portion of the duct systems and before external insulation is applied.

E. Spiral Duct Transverse Joints: Joints made with gasketed slip connections meeting leakage Class 4 do not require additional sealing when installed in accordance with the manufacturer’s instructions.

3.7 DUCT SCHEDULES

A. Ductwork General: Unless otherwise noted, construct ductwork, fittings, and transitions according to the following schedule:

AIR SYSTEM	MATERIAL	PRESSURE CLASS	SEAL CLASS
Low Pressure Supply Ducts	Galvanized	Plus 1-inch wg	C
All OSA duct downstream of DOAS unit	Galvanized	Plus 2- inches wg	B
Return Ducts – Low Pressure	Galvanized	Minus 1-inch wg	C
General Exhaust Ducts	Galvanized	Minus 1-inches wg	C
Round Supply, Return and General Exhaust Duct – Low Pressure; Size > 14-inch Diameter	Galvanized Spiral Duct	Minus 2-inch to Plus 2-inches wg	C

Round Supply, Return and General Exhaust Duct – Low Pressure; Size ≤ 14-inch Diameter	Galvanized Snap Lock– Min 26 gauge	Minus 1-inch to Plus 1-inch wg	C
Low pressure Supply, OSA Supply, Return and General Exhaust Duct Risers Which Penetrate More Than One Floor	Galvanized	Minus 1-inch to Plus 1-inch wg	B

B. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Velocity 1000 fpm or Lower:
         1) Radius Type RE 1 with minimum 0.6 radius-to-diameter ratio.
      b. Velocity 1000 to 1500 fpm:
         1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      c. Velocity 1500 fpm or Higher:
         1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
      a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
         1) Velocity 1000 fpm or Lower: 0.6 radius-to-diameter ratio and three segments for 90-degree elbow.
         2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
         3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
      c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

C. Branch Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch – Low pressure: Spin in.
      c. Rectangular Main to Round Branch – Exceeding 3-inch pressure class: Conical tap.
      d. Rectangular Main to Round Branch where main depth is less than 2-inches taller than branch diameter: 45-degree entry with square to round.
      e. Provide damper in all low-pressure branch connections.
   2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
      a. Velocity 1000 fpm or Lower: 90-degree tap.
      b. Velocity 1000 to 1500 fpm: Conical tap.
      c. Velocity 1500 fpm or Higher: 45-degree lateral.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections prior to the use or concealment of any portion of a duct system. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides.

3.9 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Sections 099113 “Exterior Painting” and 099123 “Interior Painting.”

3.10 START-UP

A. Air Balance: Comply with requirements in Section 230950 “Testing, Adjusting, and Balancing for HVAC”.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General Conditions:
1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

B. General Requirements:
1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
4. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

1.2 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Architect. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.

C. Furnish and install complete power, telephone and other electrical services as shown on drawings and/or specified herein.

D. Pay all electrical utility company service charges (if any) in connection therewith, including permanent meter deposit. Meter deposits will be refunded to Contractor at time of Owner's acceptance.

E. Furnish and install complete power distribution system as shown on drawings and/or specified herein.

F. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.

G. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.

H. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
   1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
   2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.

I. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.

J. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.

K. Furnish and install complete controls & auxiliary systems as shown on drawings and/or specified herein.

L. Furnish and install complete telephone/data raceway (including all outlet boxes, face plates, conduit raceways, telephone backboards, terminal cabinets, etc.), wiring and devices system as shown on drawings and/or specified herein.

M. Furnish and install a complete Fire Alarm System as shown on drawings and/or specified herein.

N. Furnish and install a complete Surge Protection System as shown on drawings and/or specified herein.

O. Furnish and install a complete Building Lightning Protection System as shown on drawings and/or specified herein.

P. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.

Q. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.

R. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.

S. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

PART 2 - PRODUCTS

2.1 APPROVED MATERIALS AND DEVICES

A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Architect before installation. All like items and associated equipment/systems shall be of one manufacturer.

B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27/28 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.

C. To ensure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:
1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
2. SECTION 26 22 00: DRY TYPE TRANSFORMERS
3. SECTION 26 24 16: POWER PANELBOARDS - CIRCUIT BREAKER TYPE
4. SECTION 26 24 17: LIGHTING PANELBOARDS
5. SECTION 26 28 16: SAFETY SWITCHES AND FUSES

2.2 SUBMITTALS

A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.

B. Submit to Architect ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.

C. Submit to Architect promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:
1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
2. SECTION 26 22 00: DRY TYPE TRANSFORMERS
3. SECTION 26 24 16: POWER PANELBOARDS - CIRCUIT BREAKER TYPE
4. SECTION 26 24 17: LIGHTING PANELBOARDS
5. SECTION 26 28 16: SAFETY SWITCHES AND FUSES
6. SECTION 26 41 00: LIGHTNING PROTECTION SYSTEM
7. SECTION 26 43 00: SURGE PROTECTIVE DEVICES
8. SECTION 26 50 00: LIGHTING MATERIALS AND METHODS
9. SECTION 27 10 00: STRUCTURED CABLING SYSTEM

10. SECTION 28 31 00: FIRE ALARM SYSTEM
11. SECTION 28 78 00: EMERGENCY RESPONDER RADIO COVERAGE SYSTEM
12. ALL POWER DISTRIBUTION EQUIPMENT (i.e. SWITCHBOARDS, PANELBOARDS, DRY TYPE TRANSFORMER, ETC.)
13. ALL ELECTRICAL AND TELECOMMUNICATION EQUIPMENT LAYOUTS - Submittals shall include ¼" = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical room, IT room, electrical equipment stand, generator area, or any other similar area with electrical equipment. Drawings shall indicate all panelboards, transformers, switchboards, generators, equipment racks, control panels, HVAC equipment, etc. that are located in each electrical/IT area. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. No conduits to equipment within these areas shall be installed until submittals have been provided and returned without exception by the design team.

D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Architect. The failure of the contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Architect will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.

E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Architect without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.

F. Any required resubmittal will be reviewed by the Architect for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.

G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Architect. All material proposed for substitution is subject to the approval of the Architect and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.

H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the Architect on items proposed as substitutes.

I. Submit to Architect a certificate of final inspection from local inspection department.

PART 3 - EXECUTION

3.1 SITE VISIT

A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

3.2 CLEARANCE WITH UTILITIES

A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.

B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.

C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become responsibility of the Owner.

D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

3.3 WORKMANSHIP

A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.

B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.

C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.

D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.

E. Keep site clean of accumulation of cartons, trash and debris.

3.4 SAFETY

A. The contractor is solely responsible for all job safety. Architect assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably ensure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

3.5 CONTRACT DOCUMENTS

A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.

B. Contract documents consist only of the hardcopy documents issued by the Prime Architect. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).

C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:
1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
2. Agree to pay the electrical engineer a fee of $50.00 per drawing, up to a maximum of $400 per transfer, payable upon receipt of the files.
3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.

D. Take finish dimensions at job in preference to scaled dimensions.

E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Architect.

3.6 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Architect immediately if any conflict is found.

3.7 EQUIPMENT STORAGE

A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-stored equipment as directed by Architect.

3.8 EXCAVATION, CUTTING AND PATCHING

A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Architect's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Architect before cutting into any structural members.

B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

3.9 PENETRATIONS

A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.

B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.

C. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

3.10 INSTALLATION OF EQUIPMENT - GENERAL

A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.

B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.

C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted painted or galvanized steel disconnect switches shall be mounted to galvanized steel unistrut frames.

D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.

E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.

F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

3.11 MOTORS, STARTERS AND CONTROLS

A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.

B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.

C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit under other divisions of this specification.

3.12 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.

B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

3.13 LUG/TERMINAL RATINGS

A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.

B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

3.14 EQUIPMENT FAULT CURRENT RATINGS

A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

3.15 OUTLET LOCATION

A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to ensure correct installation.

3.16 IDENTIFICATION

A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.

B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.

C. See Specification Section 26 05 53 for additional requirements.

3.17 GROUNDING

A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

3.18 TELEPHONE WORK

A. Provide telephone raceways, outlets and backboards, as shown. Provide additional work as described in Specification Section 27 10 00 and/or shown on drawings. Bond all raceways together at backboards and provide No. 6 ground wire extending from raceway bonds to cold water pipe, in 1/2 inch raceway. Carefully ream ends of all raceways.

3.19 PAINTING

A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

3.20 ACCEPTANCE TESTING

A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Architect. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.

B. The electrical sub-contractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:
1. SECTION 27 10 00: STRUCTURED CABLING SYSTEM
2. SECTION 28 31 00: FIRE ALARM SYSTEM
3. SECTION 28 78 00: EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

3.21 OPERATION AND MAINTENANCE DATA

A. One set of marked “AS BUILT” drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner’s representative.

3.22 GUARANTY-WARRANTY

A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 26 05 00

SECTION 26 05 19

POWER CONDUCTORS AND CABLES 51V-600V

PART 1 - GENERAL

1.1 DESCRIPTION

A. Power Wires and Cables

B. Low Voltage Wires and Cables

PART 2 - PRODUCTS

2.1 POWER WIRES AND CABLES - 600 VOLT

A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.

B. General Application (see below for exceptions):
1. At or Below Grade (including within slab-on-grade):
   a. #8 or larger conductors:
      1) XHHW or RHH/RHW/USE stranded (in conduit).
   b. #10 or smaller conductors for circuits terminating at motors:
      1) THHN/THWN or XHHW stranded (in conduit).
   c. #10 or smaller conductors (excluding circuits terminating at motors):
      1) THHN/THWN or XHHW solid (in conduit).
2. Above Grade:
   a. #8 or larger conductors:
      1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
   b. #10 or smaller conductors for circuits terminating at motors:
      1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
   c. #10 or smaller conductors (excluding circuits terminating at motors):
      1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).
3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Amercable, Aetna or approved equal.

C. Emergency Feeder Wiring
1. Where specifically required by NEC articles 700, 701, or other similar sections, feeder-circuit wiring for emergency systems and legally-required standby systems shall be a listed electrical circuit protective system consisting of 2-hour fire-rated, mineral insulated, copper-sheathed wiring cable (Pyrotenax System 1850 or equal).

D. Class 1 Control Cabling (120VAC Control Circuits, Etc.)
1. Unless specified otherwise, Class 1 control cabling shall:
   a. Be rated for exposed cable tray installation.
   b. Be plenum rated.
   c. Be UL-rated for the proposed application.
   d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely

color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.

e. Utilize copper conductors.
f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
i. Be rated for 600V.
j. Be industrial grade.
k. Have stranded conductors.
l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.

2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

E. Fixture Wiring
1. Conductor Types:
a. Type TFFN or XFF.
2. Minimum Sizes:
a. For fixtures up to 300 watts: #16.
b. For fixtures over 300 watts up to 1500 watts: #14.
c. For fixtures over 1500 watts: as required.
d. Conductors to concrete pour fixtures: #12.
3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.2 WIRE CONNECTIONS:

A. All connector types:
1. Shall be properly rated for the proposed application by UL and per the manufacturer.

B. At Motor Connections (within motor terminal boxes):
1. On Unshielded Wire:
a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.
2. On Shielded Power Wire:
a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.

C. Other Dry locations:
1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.

2. On Wire #10 and smaller: shall be made with one of the following:
   a. Ideal Wing Nuts or equal by 3M .
   b. Ideal Push-In Wire Connectors (for #12 and smaller only).

D. Other Wet/Damp locations:
1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by Ilsco, Burndy or T&B.
2. On Wire #10 and smaller: shall be made with one of the following:
   a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. All wires and cables shall be installed in conduit unless specifically noted otherwise.

B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.

C. No splices shall be pulled into conduit.

D. No conductor shall be pulled until conduit is cleaned of all foreign matter.

E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.

F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.

G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

3.2 POWER WIRE AND CABLE INSTALLATION:

A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.

B. Multi-wire lighting branches shall be used as indicated.

C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).

D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).

E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.

F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

3.3 WIRE CONNECTIONS

A. See Part 2 above for material types.

B. Aluminum Wire Connections:
1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).

C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.

D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.

E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.

F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.4 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
1. Cabling shall be plenum-rated, multi-conductor.
2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.5 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.6 LABELING AND COLOR CODING OF WIRE AND CABLE

A. Refer to Specification Section 26 05 53 for all labeling requirements.

B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

D. Control Conductors: Shall be color coded by use of colored “tracers”. No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

3.7 TESTING

A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification (“ATS”) standard shall be replaced by the contractor at the contractor’s expense. All final test results shall be

clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.1 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:
1. Service Equipment.
2. Transformers.
3. Non-current carrying conductive surfaces of equipment.
4. Metal Buildings.
5. Structures.
6. Other Equipment.

1.2 GENERAL REQUIREMENTS

A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to ensure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.

B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall ensure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.

B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be “jumpered” by an appropriate bonding conductor.

2.2 GROUNDING ELECTRODES

A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

2.3 CONNECTIONS

A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall

be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.

B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).

C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.

D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.

E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

2.4 MANUFACTURERS

A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.

B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.

C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.

D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.

E. Split post grounding shall be as manufactured by Burndy or T and B.

PART 3 - EXECUTION

3.1 MAIN SERVICE GROUND

A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:
1. The main underground cold water pipe (metal).
2. The metal frame of the building.
3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

3.2 TRANSFORMER GROUNDS

A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

3.3 EXPOSED NON-CURRENT-CARRYING METAL PARTS

A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.

B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8".

C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground.

D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.

F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.

G. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.

H. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

3.4 ACCEPTANCE DOCUMENTATION AND TESTING

A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.

B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.

C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 ("Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System"). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Architect prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 26 05 26

SECTION 26 05 33

RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
1. Conduits
2. Conduit Fittings
3. Couplings & Connectors
4. Bushings
5. Raceway Hardware, Conduit Clamps & Supports
6. Watertight Entrance Seal Devices

PART 2 - PRODUCTS

2.1 CONDUITS

A. Rigid Galvanized Steel and I.M.C.:
1. Shall be galvanized outside and inside by hot dipping.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

B. E.M.T.:
1. Shall be Electro-Galvanized.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

C. Rigid Aluminum:
1. Shall be manufactured of 6063 Alloy, T-1 temper.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

D. Schedule 40 and 80 PVC:
1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

E. HDPE Innerduct
1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
2. Shall be corrugated unless noted otherwise.
3. Shall be manufactured by Carlon, Ipex or equal.

F. Flexible Metallic Conduit:
1. Shall be continuous spiral wound and interlocked galvanized material, code approved for grounding.

G. Liquidtight Flexible Metallic Conduit:
1. Shall be galvanized steel-core sealtite, code approved for grounding.
2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

2.2 FITTINGS, COUPLINGS & CONNECTORS

A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.

B. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.

C. E.M.T. couplings and connectors shall be set screw, or steel compression type. All couplings and connectors shall be 720B, 730, 750B, or 760 series of Efcor or equal series of Raco. Pressure indented type connectors or cast metal will not be approved for any location. E.M.T. couplings and connectors shall be as manufactured by O-Z/Gedney, T&B, Efcor, Raco, Midwest or equal. E.M.T. fittings, couplings and connectors located within concrete (where allowed) shall be compression type and shall be adequately sealed with tape to ensure a concrete-tight seal.

D. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.

E. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.

F. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.

G. All LB unilets sizes 1 ¼" or larger shall have rollers.

H. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

2.3 BUSHINGS

A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).

B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.

C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

2.4 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).

B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

C. Supports in exterior, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.

E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

2.5 WATERTIGHT ENTRANCE SEAL DEVICES

A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).

B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Minimum Diameter: 1/2-inch.

B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
   1. Exterior, Exposed: Rigid Galvanized Steel or I.M.C. unless otherwise noted.
   2. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See "transition" items below for additional requirements. Conduits shall be left exposed until after Architect's observation.
   3. Interior, Exposed:
      a. Hazardous Locations: Rigid Galvanized Steel .
      b. Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Rigid Galvanized Steel or I.M.C. .

c. Dry Locations Where Subject to Mechanical Damage (including, but not limited to, below 10'-0" A.F.F. in shop, storage, warehouse and other similar areas): Rigid Galvanized Steel or I.M.C..
d. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): Schedule 80 PVC.
e. Other Dry Locations: E.M.T.

4. Interior, Concealed:
   a. Embedded inside Poured Concrete Walls, Ceilings or Floors, with a minimum of 2" of concrete between finished surface and outer wall of conduit on all sides, where no anchor bolts, screws or other similar items will be installed: Schedule 40 PVC. PVC conduit shall convert to metallic conduit (exact type as specified elsewhere within this section) prior to exiting poured concrete-encasement of wall, ceiling, floor or ductbank. See "transition" items below for additional requirements.
   b. Other Raceways Embedded inside Poured Concrete Walls, Ceilings or Floors (not meeting requirements above): Rigid Galvanized Steel or I.M.C. (coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint where below grade or within concrete).
   c. Other Raceways: E.M.T.
5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
   a. Exterior or Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
   b. Dry, Interior Locations: Flexible Metallic Conduit (shall generally not exceed 24 inches in length).
6. Terminations at fixtures mounted in grid-type ceilings:
   a. Flexible Metallic Conduit or MC cabling (shall generally not exceed 72 inches in length and shall run from junction box to fixture, not from fixture to fixture).
7. Transition from underground or concrete-encased to exposed:
   a. Convert PVC to Rigid Galvanized Steel (coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint where below grade or within concrete) utilizing Rigid Galvanized Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6" above floor level, and shall be installed at uniform heights.

3.2 RACEWAY INSTALLATION

A. General:
1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
3. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
4. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
5. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.

6. All PVC joints shall be made as follows:
   a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
   b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
   c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
7. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
8. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
9. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
10. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings. 1/2-inch conduit shall not contain conductors larger than No. 12 or more than four (4) No. 12 conductors.
11. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) .

B. Routing/Locating:
1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6” of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3” from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. A minimum of 12” of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
8. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:
1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.

2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
4. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:
1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
3. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
4. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
5. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:
1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
3. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
4. Where E.M.T. enters sheet metal boxes they shall be secured in place with approved insulating fittings.
5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.
7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
8. Conduit ends shall be carefully plugged during construction.
9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:
1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.
2. All penetrations shall be at right angles unless shown otherwise.
3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
5. All raceways entering structures, or where water is otherwise capable of entering equipment/devices through the raceway system, shall be sealed (at the first box or outlet) with foam duct sealant to prevent the entrance of gases or liquids from one area to another or into equipment/devices.
    a. Where the elevation of the raceway penetration (into the structure) is no more than 15' below the other (higher) end of the same raceway, Polywater FST sealant (rated to hold back up to 22' of continuous water head pressure), or pre-approved equal, shall be used.
    b. Where the elevation of the raceway penetration (into the structure) is between 15' and 75' below the other (higher) end of the same raceway, Polywater PHRD Custom Mechanical Seals (rated to hold back up to 36psi or 83' of continuous water head pressure), or pre-approved equal, shall be used.
    c. Where the elevation of the raceway penetration (into the structure) is more than 75' below the other (higher) end of the same raceway, the contractor shall propose a custom solution designed to hold back or to drain the possible water within the associated raceway. Submittals shall be provided to the engineer for review/approval, including a summary of the anticipated elevations/PSIs, details of the proposed installation, cut-sheets of devices/materials, etc.
6. Additionally, where necessary to ensure that water does not enter equipment/devices through the raceway system (where raceways extend to equipment/devices from wet areas), junction boxes with drain assemblies in bottom shall be located at low point of raceway system near equipment/devices (to drain water out of raceway system before it enters equipment/devices). Contractors shall provide drains in raceway systems where so necessary to prevent water entry into equipment/devices.
7. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
    a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
    b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.
8. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).
9. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.

G. Exterior Electrical Ductbanks:
1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:

a. A minimum of 3" of concrete shall encase each side of all ductbanks.
b. A minimum of 1 ½" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.
c. Top of concrete shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.
d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 26 05 33

SECTION 26 05 34

OUTLET BOXES, JUNCTION BOXES, WIREWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Outlet and Junction Boxes

B. Pull Boxes

C. Wireways

PART 2 - PRODUCTS

2.1 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.

B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.

C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

2.2 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.

B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.

C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.

D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.

E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.

F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:
1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.
2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.

3. Cover shall be bolt-down include factory-labeling to read “Electric”, “Communications” or other as directed.
4. Hardware shall be stainless steel.
5. Shall be Quazite PG/LG Style or approved equal.

G. Galvanized Cast Iron Below-Grade Pull Boxes:
1. Enclosures, boxes and cover are required to conform to AASHTO H-20 requirements for deliberate vehicular traffic applications unless noted otherwise.
2. Cover shall be checkered, bolt-down include factory-labeling to read “Electric”, “Communications” or other as directed.
3. Hardware shall be stainless steel.
4. Shall be furnished with grounding kit.
5. Shall be O-Z/Gedney Type YR or approved equal.
   a.

PART 3 - EXECUTION

3.1 APPLICATION

A. General
1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16”)
1. Sheet metal boxes shall be used on concealed work in ceiling or walls and exposed work in dry, interior locations
   a. Exception: Where exposed and installed within finished/public spaces such as offices, corridors, lobbies, etc., cast boxes shall be used for wiring device outlets. Cast boxes are not required in back-of-house areas such as electrical rooms, mechanical rooms, etc. .
2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed.
3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.
7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

C. Junction & Pull Boxes (larger than 4-11/16”)
1. For all below grade exterior use and elsewhere as shown:
   a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).

   b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
2. All boxes installed exposed in exterior or wet areas shall be powder-coated galvanized steel (NEMA 3R).
3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
5. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
6. All others shall be oil tight JIC box not less than 16 gauge.

3.2 INSTALLATION

A. General
1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.
4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 26 05 53 for identification requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")
1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
3. There shall be no more knockouts opened in any sheet metal box than actually used.
4. Any unused opening in cast boxes shall be plugged.
5. Back to back boxes to be staggered at least 3 inches.
6. Under no circumstances shall through-the-wall boxes be used.

C. Junction & Pull Boxes (larger than 4-11/16")
1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

D. Wireways and/or wall-mounted equipment
1. Mount each wireway to channels of the same metal type as the wireway.
2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 26 05 34

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Wire and cable identification.

B. Pullbox & Junction Box Identification

C. Electrical distribution & utilization equipment identification.

D. Emergency and Standby Power receptacle identification.

PART 2 - PRODUCTS

2.1 WIRE AND CABLE IDENTIFICATION

A. Intermediate Locations:
1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.

B. Circuit/Cable Termination Locations:
1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

2.2 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

B. Labels on electrical distribution equipment fed from emergency or legally-required standby sources (such as emergency generators) shall be white-on-red engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive.

2.3 EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as follows:
1. Emergency System source: Red engraved lettering to read “EMERGENCY”.
2. Legally-Required or Optional Standby Generator source:
   a. If only part of facility is fed with generator backup: Black engraved lettering to read “FED FROM GENERATOR”.
   b. If entire facility is fed with generator backup: No “….GENERATOR…” label required.

PART 3 - EXECUTION

3.1 GENERAL

A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Architect for review and comment prior to installation.

B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.

C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).

D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

3.2 WIRE AND CABLE IDENTIFICATION

A. General:
1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.

B. Intermediate Locations:
1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
    a. Wireways
    b. Pullboxes/Junction boxes larger than 4-11/16”
    c. Pullboxes/Junction boxes through 4-11/16” where wires and cables are not easily identifiable via the color coding and box labeling
    d. Vaults & Manholes
    e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
    f. Other similar intermediate locations.
2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:
    a. From where the circuit originates (including panel designation and circuit number):
        1) Ex: “FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)”
    b. To where the circuit extends (using the common name of the equipment):
        1) Ex: “TO: RTU-6 (ON ROOF)”
    c. The purpose of the circuit:
        1) Ex: “POWER”
    d. The set number (If parallel power feeds are used).
        1) Ex: “SET NO. 3 OF 4”

C. Circuit/Cable Termination Locations:
1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

D. Refer to Specification Section 26 05 19 for all color-coding requirements of wires and cables.

3.3 PULLBOX & JUNCTION BOX IDENTIFICATION

A. Concealed pullboxes/junction boxes:
1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: “RP-1A Cir. 1, 2 & 3”). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

B. Exposed pullboxes/junction boxes:
1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled “Power”, “Telecommunications”, “Fire Alarm” or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

C. Where pullboxes/junction boxes are named on contract documents (Ex:”PULLBOX #3”), an engraved nameplate shall be installed on the front surface of the box to identify the name.

3.4 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. General:
1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:
1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:
   a. Ex: First Line: “NAME: RP-A”, Second Line: “120/208V-3Ø-4W”, Third Line: “FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)”
2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.)::
1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade

type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
   a. Ex: First Line: "RTU-6", Second Line: "FED FROM: PP-A CIR. 5"
2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: "WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH".
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: "WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER".

D. Emergency Systems:
1. A sign shall be placed at the service entrance equipment (and at any remote shunt trip operators, or similar, for service equipment) indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.
2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.
3. Where an Essential Electrical System (EES) is installed, all enclosures, raceways and equipment that are components of the EES shall be readily identified as such. Raceway shall be identified at intervals not exceeding 25 ft.

E. Services:
1. All Service Equipment:
   a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.
      1) Ex: First Line: "AVAILABLE FAULT CURRENT: 16,154 AMPS", Second Line: "DATE CALCULATED: JULY 8, 2013"
   b. All service entrance equipment shall be clearly labeled as being service entrance rated.
2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:
1. Generators shall be labeled with engraved nameplates identifying name of equipment.

3.5 EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as described above.

3.6 OTHER IDENTIFICATION

A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 26 05 53

SECTION 26 05 73

POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   1. Power Distribution System Electrical Studies.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Short Circuit Studies, Protective Devices Evaluation Studies, Protective Device Coordination Studies and Arc Flash Hazard Studies shall be performed by the same entity, which shall be a Professional Engineer registered in the state where the equipment will be installed. The studies shall be per the requirements set forth in the latest edition of NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.

B. The studies shall be submitted to the Architect prior to shipment of any electrical distribution equipment.

C. The studies shall include all portions of all electrical systems affected by the project (including any existing systems/equipment) from the utility service to any existing equipment at the facility (including all existing equipment fed from the same service point as any new equipment) and to all new equipment installed under this contract. All induction motors 50 HP or below and fed from the same bus may be grouped together. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. See individual study sections below for additional scope requirements.

D. The studies shall be performed using the latest revision of the SKM Systems Analysis Power*Tools for Windows (PTW) or EasyPower software program.

E. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.

F. The contractor shall be responsible for collecting data on any existing or proposed electrical equipment, devices, conductors, etc. as required to prepare the study, and shall supply pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the studies to be completed prior to shipment of equipment.

G. The Power Distribution System Electrical Studies shall be performed by Square 'D', G.E., Siemens or Cutler Hammer; or a third-party vendor if specifically approved by the engineer prior to preparation of the studies.

H. The proposed vendor shall have completed a minimum of five (5) equivalent Arc-Flash Hazard Studies in the past three (3) years.

2.2 SHORT CIRCUIT STUDY

A. The Short Circuit Study shall be performed with aid of a computer program. The study input data shall include the power company's short circuit contribution, resistance and reactive components of the branch impedances, X/R ratios, base quantities selected, and other source impedances.

B. Short circuit momentary duty values and interrupting duty shall be calculated on each individual basis with the assumption that there is a three-phase bolted short circuit at the respective switchgear bus, switchboard, low voltage motor control center, distribution panelboard, and other significant locations throughout the system.

C. The short circuit tabulation shall include symmetrical and asymmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contributions from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

2.3 PROTECTIVE DEVICE EVALUATION STUDY

A. The Protective Device Evaluation Study shall be performed to determine the adequacy of circuit breakers, switches, transfer switches, and fuses by tabulating and comparing the short circuit rating of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.

B. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Architect's attention.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

A. The Protective Device Coordination Study shall be performed to provide the necessary calculation and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.

B. The coordination study shall show the best coordination attainable for all breakers down through the largest breaker at each piece of distribution equipment. Coordination study shall demonstrate selective coordination where required by applicable codes or contract documents.

C. Phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices. Where ground fault protection is used, coordination of the ground fault protection with the first downstream overcurrent phase protection device shall be demonstrated.

D. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves be maintained.

2.5 ARC-FLASH HAZARD STUDY

A. The Arc-Flash Hazard Study shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.

B. The Arc-Flash Hazard Study shall be performed in conjunction with a short-circuit Study and a time-current coordination Study.

C. The Arc-Flash Hazard Study shall be performed for the following equipment:
1. All Distribution Equipment – This includes but is not limited to the following:
   a. Switchgear
   b. Switchboards
   c. Motor Control Center
   d. All Lighting and Power Panelboards
   e. Fused Disconnect Switches rated greater than 100A
2. Separately enclosed devices fed from protection device rated greater than100A - This includes but is not limited to the following:
   a. Control Panels
   b. VFD's
   c. RVSS

D. A generic Arc-Flash label shall be applied to other electrical equipment that has not been included in the study. This includes but is not limited to the following equipment:
1. Non-fused Disconnect Switches
2. Fused Disconnect Switches rated 100A or less
3. Transformers
4. Control Panels, VFD's, RVSS, etc. rated 100A or less

E. Where a main protective device is provided, the study shall be performed on the line side and load side of the main. The worst-case result shall be used for the study result and label.

F. The Study shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

G. Where incident energies are calculated to fall within the high marginal region of a given Hazard/Risk Category Level, the Hazard/Risk Category Level shall be increased one level.

H. The Arc-Flash Hazard Study shall be performed in compliance with the latest IEEE Standard 1584, the IEEE Guide for Performing Arc-Flash Calculations. Where IEEE 1584 does not have a method for performing the required arc-flash calculations (such as for single phase equipment), calculations shall be performed and system shall be modeled using modules/methods as recommended by the arc flash software supplier (for example, using SKM Unbalanced/Single Phase Studies module for modeling single phase systems).

I. Equipment labels to identify AFIE and appropriate Hazard/Risk Category in compliance with NFPA 70E and ANSI Z535.4 (latest version of these requirements) shall be provided to the Electrical Contractor. The Electrical Contractor shall affix the labels to the distribution equipment devices as directed by the equipment manufacturer. These labels shall, at a minimum, include the following:
1. WARNING label.
2. Hazard/Risk Category.

3. Arc Flash Boundary Distance.
4. Incident Energy (in cal/cm2) at Working Distance.
5. Shock Hazard Voltage.
6. Limited Approach Boundary Distance.
7. Restricted Approach Boundary Distance.
8. Prohibited Approach Boundary Distance.
9. Equipment Name.
10. Name of Firm who prepared the Study.
11. Project Number of the Firm who prepared the Study.
12. Date that the Study was prepared.
13. Method for calculating analysis data.
14. Statement to read: "Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label" (or equivalent).

PART 3 - EXECUTION

3.1 SUBMITTAL REQUIREMENTS

A. The results of the studies shall be summarized in a final report. The report shall include the following sections:
   1. General:
      a. Description, purpose, basis and scope of the studies
      b. Single line diagram of the portion of the power system which is included within the scope of the work. The single line diagram shall fit on one sheet of paper (size as required) unless approved otherwise by engineer. The following information shall be shown on the single line diagram:
         1) Device Name
         2) Branch Fault Currents with directional indicators
         3) General Location (for busses only)
         4) Other basic component information such as cable type, cable length, breaker rating, buss short circuit rating, transformer voltages, transformer size, fuse size, etc..
   2. Short Circuit Study:
      a. Tabulation of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
   3. Protective Device Evaluation/Coordination Study:
      a. Protective devices time versus current coordination curves**,** tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
      b. Fault current calculations including definitions of terms and a guide for interpretation of computer printout.
      c. Documentation from utility company on their letterhead showing their anticipated values of available short circuit currents X/R ratios and protective devices with which the power distribution system will coordinate.
      d. Time-current characteristics of the respective protective devices shall be plotted on log-log paper. Plots shall be printed in color with a dedicated color and pattern for each curve for clear identification.
      e. Plots shall include complete titles, respective single line diagrams and legends, and associated power company's relay or fuse characteristics, significant motor starting

characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breakers trip curves and fuses.

f. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents.

g. The coordination plots for phase and ground protective devices shall be provided on a system basis.

h. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.

4. Arc-Flash Hazard Study:

a. Tabulation of device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.

b. Recommendations for reducing AFIE levels and enhancing worker safety.

B. Furnish all labor, materials, calculations, electrical equipment, technical data and incidentals required to provide a complete short circuit study, coordination study and arc flash hazard study of protective devices, busses, etc. from the utility service to any existing equipment at the facility and all new equipment installed under this contract.

C. The study shall comply with the following applicable provisions and recommendations of the latest revisions of the following: ANSI C37.5, IEEE Standard No. 399, and IEEE Standard No. 141.

D. Submit calculations and results of the short circuit, protective device evaluation and coordination and arc flash hazard studies prior to submitting shop drawings for new equipment. Contractor shall verify that all proposed equipment is properly rated per the short circuit and protective device evaluation portions of the study prior to releasing equipment for manufacturing.

E. Submit a copy of a sample typical arc flash label layout (meeting requirements outlined above) that will be used for the project.

F. Submit final electronic copies of all SKM program files/models/input data/etc. used to perform the study to the owner with final close-out documents. These files shall be complete as required to allow future users to recreate the study.

3.2 INSTALLATION

A. Contractor shall adjust all breaker settings as recommended by the coordination study prior to energizing equipment.

B. Contractor shall affix arc flash hazard notification labels (as determined by the results of this study) to each piece of distribution equipment prior to energization of equipment. A generic arc-flash warning label shall be affixed to any electrical equipment not included in the analysis as outlined above.

C. Where short circuit rating of equipment is dependent on setting of upstream overcurrent device, provide and install label for equipment indicating the required settings of the associated device.

END OF SECTION 26 05 73

SECTION 26 22 00

DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   1. Dry Type Transformers

1.2 GENERAL REQUIREMENTS

A. Voltage for 3 phase units shall be 480V to 120/208V, three phase, four wire unless shown otherwise. Voltage of single phase units shall be 480V to 120/240V single phase, three wire unless shown otherwise.

B. Where isolation transformer is indicated on drawings, furnish K-13 rated transformer with dual-faraday electrostatic shield.

C.

PART 2 - PRODUCTS

2.1 INSULATION

A. Transformers shall be ventilated with insulation to withstand a minimum of 150 degree Celsius temperature rise (Class 220 insulation) unless specifically shown otherwise on the drawings.

2.2 ENERGY EFFICIENCY

A. Transformers shall comply with the latest applicable DOE energy efficiency requirements and latest edition of NEMA standard TP-1 and shall be labeled for the EPA Energy Star Program.

2.3 SOUND RATING

A. Sound level shall not exceed a 5db reduction from ST-20 maximum requirements. Sound level in decibles may not exceed the following:

	KVA	DESIGN SOUND LEVEL
1.	KVA	DESIGN SOUND LEVEL
2.	0-45	40 db
3.	46-150	45 db
4.	151-300	50 db
5.	301-700	57 db

B. Sound levels shall be determined in accordance with NEMA and ASA Standards. Core and coils shall be mounted on vibration isolator pads.

2.4 ENCLOSURES

A. Transformers mounted in dry, interior locations shall be furnished with NEMA 1 enclosures unless shown otherwise.

B. Transformers mounted outdoors or in wet locations shall be furnished with NEMA 3R enclosures with drip shields unless shown otherwise.

C. Transformers installed inside motor control centers or other similarly enclosed equipment may be "open" units not requiring additional enclosures.

2.5 CLEARANCE REQUIREMENTS

A. Transformer construction/efficiency/ventilation shall allow 3" (or less) clearance from rear and sides.

2.6 TAPS

A. All units shall be equipped with a minimum of two (2) 2 ½% taps above nominal (FCAN) and a minimum of four (4) 2 ½% taps below nominal (FCBN) as required to allow adjustment of the turns ratio of the transformer to account for site voltage adjustments.

2.7 MANUFACTURER

A. Transformers shall be Square 'D', G.E., Siemens or Cutler Hammer.

PART 3 - EXECUTION

3.1 GENERAL

A. Minimum clearances shall be provided on all sides of transformers per manufacturer's and code requirements.

B. Where site voltages so require, transformer taps shall be adjusted to maintain nominal voltage on secondary side of transformer. Adjustment of dry-type transformer taps shall not be made until all upstream voltage adjustments (such as voltage tap adjustments at service transformers) are finalized.

C. Refer to Specification Section 26 05 26 for transformer grounding requirements.

D. Refer to Specification Section 26 05 53 for transformer identification requirements.

3.2 MOUNTING

A. Transformers shall be mounted as indicated on plans. No units shall be wall mounted unless shown or directed otherwise.

B. Floor mounted transformers:
1. Shall be installed on a minimum of four (4) double-deflection neoprene vibration isolators (by Amber/Booth, Korfund Dynamics or Mason Industries - size as required – with seismic restraint capability ratings as required by the associated seismic zone).
2. Shall be installed on four-inch thick concrete pads unless specifically shown otherwise. Pad shall have beveled edges.

C. Suspended transformers:
1. Shall be trapeze-mounted on unistrut frame supported by a minimum of four steel rods and shall be mounted as high as possible or at height directed (transformers shall not be

mounted above lay-in ceilings or in areas with restricted ventilation). Shall be installed using a minimum of four (4) double-deflection neoprene vibration isolators (by Amber/Booth, Korfund Dynamics or Mason Industries - size as required – with seismic restraint capability ratings as required by the associated seismic zone).

2. Contractor shall supply extra supports as may be required due to size and weight.
3. Additional seismic bracing shall be provided for suspended transformers in seismic zones as required to provide a fully code-compliant installation.

END OF SECTION 26 22 00

SECTION 26 24 16

POWER PANELBOARDS - CIRCUIT BREAKER TYPE

PART 1 - GENERAL

1.1 GENERAL

A. The work under this section includes but is not limited to the following:
1. Power Panelboards
2. Power Circuit Breakers

PART 2 - PRODUCTS

2.1 PANELBOARDS - GENERAL

A. Panelboards shall be dead front type, having lugs only or circuit breaker in mains as shown in panelboard schedule with circuit breaker branches.

B. Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on plans. Such rating shall be established by heat rise test with Maximum hot spot temperature on any connector or bus bar not to exceed 50 degrees C rise above ambient at full rated load. Heat rise test shall be conducted in accordance with UL Standard UL67. Bus structure shall be tin-plated aluminum or tin-plated copper. All neutral busses shall be full size. All panelboards shall contain ground buss.

C. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

D. Panelboards shall be listed by Underwriters Laboratories and shall bear the UL label. Panelboards shall be suitable for use as service equipment when required.

E. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.

F. Service entrance panelboards shall be provided with barrier such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations**.**

2.2 CIRCUIT BREAKERS

A. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.

B. Circuit breakers shall be quick-make and quick-break, whether actuated automatically or manually. Circuit breakers shall have inverse time tripping characteristics with automatic release which shall trip free of the handle. Circuit breaker handles shall be three distinct positions—“OFF”, “ON”, and “TRIPPED”. When a circuit breaker opens on overload or short

circuit, the operating handle shall automatically assume the "TRIPPED" position.

C. Multipole breakers shall be internal common trip with single operating handle. External handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).

D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.

E. Circuit breakers shall be of the bolt-on type.

F. Circuit breakers shall be "FA" frame and larger.

G. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

H. The front face of all circuit breakers shall be flush with each other. Breaker numbers shall be permanently attached to trim.

I. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

2.3 CABINETS, TRIM AND WIREWAY SPACE

A. Clear space from bottom of lugs to bottom of wireway shall be not less than 6 inches for 400 amps and below, 10 inches for 600 amps, 12 inches for 800 amps and above.

B. Panelboard interiors shall be fastened to cabinets by adjustable aligning supports.

C. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets.

D. Fronts of cabinets shall be made from a single sheet of full finished steel having the door cut out. Doors shall have flush hinges, and lock utilizing all metal construction (with all locks keyed alike). Front shall be attached to cabinets with hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim. Front shall be provided with a metal directory and holder with clear plastic covering welded to the inside of the door. Fronts shall be code gauge full-finished steel with rust inhibiting primer and baked enamel finished in ASA #49 gray. Panelboards installed in exterior or wet locations shall have NEMA 3R enclosures.

E. Each section of multi-section panelboards shall be of matching heights and depths.

F. Panelboard enclosures shall be furnished as shown on panel schedule on plans for surface, flush or motor control center mounting.

2.4 MANUFACTURER

A. Panelboards shall be as manufactured by Square 'D', G.E., Siemens or Cutler Hammer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to ensure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6’-7” A.F.F..

B. Wiring in panelboard gutters shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.

3.2 PERFORMANCE TESTING

A. The ground-fault protection system when provided shall be performance tested after installation by a qualified person(s) using primary current injection in accordance with the instructions provided with the equipment and NEC requirements. A written record of the testing shall be provided.

B. The arc energy reduction protection system when provided shall be performance tested after installation by a qualified person(s) using primary current injection in accordance with the instructions provided with the equipment and NEC requirements. A written record of the testing shall be provided.

3.3 PANEL IDENTIFICATION

A. Refer to Specification Section 26 05 53.

END OF SECTION 26 24 16

SECTION 26 24 17

LIGHTING PANELBOARDS

PART 1 - GENERAL

1.1 GENERAL

A. The work under this section includes but is not limited to the following:
1. Lighting Panelboards
2. Circuit Breakers

PART 2 - PRODUCT

2.1 PANELBOARDS

A. Enclosure:
1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in exterior or wet locations shall have NEMA 3R enclosures.
3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
8. Each section of multi-section panelboards shall be of matching heights and depths.

B. Bussing/Lugs:
1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
2. All bussing and associated connectors shall be tin-plated aluminum or tin-plated copper.
3. All panelboards shall contain ground buss.
4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
5. Buss connectors shall be for distributed phase arrangement.
6. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.
7. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power

distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

8. Service entrance panelboards shall be provided with barrier such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations

C. Breaker arrangement and numbering:
1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
3. Breaker numbers shall be permanently attached to trim.
4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

2.2 CIRCUIT BREAKERS

A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.

B. Circuit breakers shall be of the bolt-on type.

C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).

D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.

E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

2.3 SPECIAL REQUIREMENTS

A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.

B. Lighting panels larger than 400A shall conform to the requirements for power panels.

2.4 MANUFACTURER

A. Panelboards shall be as manufactured by Square 'D', G.E., Siemens or Cutler Hammer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to ensure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6’-7” A.F.F..

B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.

C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

3.2 PANEL IDENTIFICATION

A. Refer to Specification Section 26 05 53.

END OF SECTION 26 24 17

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Wiring Devices

B. Plates

C. Finishes

PART 2 - PRODUCTS

2.1 WIRING DEVICES AND PLATES

A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

B. Receptacles shall have blade configuration and shall be heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.

D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

2.2 FINISHES

A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.
   1. Exceptions:
      a. Emergency wiring devices shall be red.
      b. Isolated ground wiring devices shall be orange.

B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.

C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.

D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be

of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

E. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.

F. See "Electrical Identification" specification section for coverplate labeling requirements.

PART 3 - EXECUTION

3.1 GENERAL MOUNTING

A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.

B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.

C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.

D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.

E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.
1. Receptacles and telephone outlets in offices and other finished areas: 1'-6" to the center of the box.
2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0" to the center of the box.
3. Receptacles over counters: As Noted
4. Switches, general: 4'-0" to the top of the box.
5. Fire Alarm Pull Stations: 4'-0" to the top of the box.
6. Fire Alarm Audio/Visual Devices: As shown on fire alarm shop drawings (Entire lens shall be above 80" and below 96" per NFPA 72).
7. Push-button, etc., general: 4'-0" to the top of the box.
8. Other device types: verify with engineer prior to rough-in.

END OF SECTION 26 27 26

SECTION 26 28 16

SAFETY SWITCHES AND FUSES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Safety Switches

B. Fuses

C. Branch Feeders

D. Feeders

PART 2 - PRODUCTS

2.1 SAFETY SWITCHES

A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.

B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.

C. Fused switches shall have provisions for class R, rejection type fuses.

2.2 FUSES (600V)

A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class “R” Fusetron.

B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

2.3 MANUFACTURER

A. Safety switches shall be as manufactured by Square 'D', G.E., Siemens or Cutler Hammer.

B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

PART 3 - EXECUTION

3.1 SAFETY SWITCHES

A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.

B. Locations shown for safety switches on plans are diagrammatical only. Exact locations shall be field coordinated by contractor as required to provide code-required clearances.

C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA3R outdoors and

in wet areas.

D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

3.2 FUSES

A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the contractor shall provide fuses sized as directed by the associated equipment supplier at no additional cost.

B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION 26 28 16

SECTION 26 41 00

LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install all materials and labor required to provide a complete and functional Lightning Protection and Common Grounding System as indicated, in strict accordance with this section of the Specifications and the applicable Contract Drawings.

1.2 STANDARDS & QUALITY ASSURANCE

A. The lightning protection system shall comply with all requirements of the latest edition of each of the following codes and standards. The latest edition of these codes and standards form a part of this specification:
1. U.L. Standard 96A.
2. Lightning Protection Institute - Installation Code LPI-175.
3. N.F.P.A. 780.

B. Equipment manufacturer shall be certified by the Lightning Protection Institute, and products approved for UL listing. All materials shall be manufactured by one of the following manufacturers:
1. Bonded Lightning Protection Systems
2. East Coast Lightning Protection
3. Erico/Eritech Lightning Protection
4. Harger Lightning Protection
5. Preferred Lightning Protection
6. Robbins Lightning
7. Thompson Lightning Protection

C. For approval of LPI manufacturer other than specified, complete proposed material data and installation drawings shall be submitted to Engineer for review not less than 10 days prior to bid date.

D. In order to insure integrity of installation, the system shall be installed under the direct jobsite supervision of a Certified Master Installer/Designer, who has qualified under the LPI's Certification Program as a Master Installer/Designer.

1.3 SUBMITTALS

A. Complete shop drawings of the entire lightning protection system showing the type, size, mounting details, and location of all equipment, grounds, cable routings, roof materials (for coordination of lightning protection system materials), etc., shall be submitted to the Architect-Engineer for approval prior to start of work.

B. Submittals shall document the local manufacturer’s representative’s Certified Master Installer/Designer qualifications from LPI.

PART 2 - PRODUCTS

2.1 SYSTEM

A. System materials in general shall be copper, copper alloy or aluminum with high-copper content bronze castings or aluminum castings (all compatible with associated surface materials and installed per UL, NFPA & LPI standards), and shall comply in weight, size and composition for the class of structure to be protected. The system shall consist of all necessary cables, air terminals, mounting bases, fittings, couplings, connectors, fasteners, surge protection devices, etc., as required to give a complete and coordinated system.

B. Copper conductors shall be utilized for all downleads and below-grade conductors.

C. Aluminum components shall be utilized in cases where copper is not compatible with mounting surfaces.

D. All ground rods shall be copper-clad steel.

E. All cable and all air terminals shall bear proper UL labels.

F. Air terminals shall have blunt tips.

G. System design shall be concealed wherever practical, with roof perimeter cables concealed in parapet walls, and mid-roof cables installed under roof slabs. Exposed cable on parapet walls will only be accepted if structural details preclude cable concealment. Cable drops for roof penetrations at downlead locations shall be made with solid-bar thru-roof connectors, with copper rod flashings. Bond rebars top and bottom at each downlead position and risers. Primary and secondary bonding of roof metals and equipment shall also be under roof slabs. Ground level, intermediate and roof level potential equalization shall be provided per current building Code classifications.

H. All system fittings except cable holders, regardless of Structure classification, shall be heavy-duty type made from bronze or aluminum castings and secured with bolted-pressure clamps. Pressure plates made from stamped or pressed metal parts, or fittings utilizing crimp-type pressure devices will not be allowed. All bolts, screws, and related type hardware shall be stainless steel.

I. Contractor shall coordinate with the roofing contractor to insure compatibility of any adhesive with the roofing system in use.

J. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface, and shall be spaced according to LPI, UL, and NFPA code requirements.

K. Where applicable, an approved bimetal transition fitting shall be used at the roof level to change from aluminum roof conductor to copper downlead cable.

L. Surge protection devices shall be provided on the power, telecommunications and other conductive electrical services at the points of entrance into the building(s) as required by UL96A in order to obtain the UL Master Label Certificate of Inspection. It shall be the

responsibility of the electrical contractor to install or verify that a proper surge protection device has been installed on the each of the building electrical services to meet this requirement. This may require surge protection devices in addition to those specifically shown on plans or called out within other specifications.

PART 3 - EXECUTION

3.1 SUPERVISION AND CERTIFICATION

A. The manufacturer's local representative shall be a Certified Master Installer/Designer under the LPI program, and shall provide direct jobsite technical supervision to Contractor's personnel during installation to insure compliance with all Code requirements. Upon job completion, Contractors shall furnish Owners with written certification on UL Master Label "C",that system is installed in compliance with above Standards.

END OF SECTION 26 41 00

SECTION 26 43 00

SURGE PROTECTIVE 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 field-mounted SPDs for low-voltage (<1000 V) power distribution and control equipment.

B. The specified unit(s) shall provide effective high energy transient voltage surge suppression, surge current diversion and high frequency noise attenuation in all electrical modes for equipment connected downstream from the facility's meter or load side of the main overcurrent device. The unit(s) shall be connected in parallel with the facility's wiring system.

C. The unit(s) shall be designed and manufactured in North America by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacturer of such products for minimum of ten (10) years.

D. All products that are submitted according to these specification will be required to meet this specification in it's entirety for both service and distribution TVSS systems. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

1.3 DEFINITIONS

A. VPR: Voltage Protection Rating.

B. SPD: Surge Protective Device(s)

C. $I_{(n)}$: Nominal Discharge Current

1.4 SUBMITTALS

A. See specification section 26 05 00.

B. Product Data: For each type of product indicated. Include:
1. Maximum Single Impulse Surge Current Rating.
2. Surge Life (Repetitive Surge) Rating.
3. UL1449 (Latest Edition) Voltage Protection Ratings (VPR).
4. UL1449 (Latest Edition) Nominal Discharge Current (In).
5. Product dimensions and weights.
6. Furnished specialties and accessories.

C. Qualification Data:

D. Safety Agency File Number.

E. ISO 9001-2008 Certification.

F. ISO 1401-2001 Certification.

G. Operation and Maintenance Data: For SPDs to include all submittal data and any applicable operation and maintenance manuals.

H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

B. The unit shall be UL 1449 Listed and CUL Approved as a Surge Protective Device and UL 1283 Listed as an Electromagnetic Interference Filter

C. Provide 2nd party certified data demonstrating SPD response to ANSI/IEEE C62.41.2-2002 standard waveforms when tested according to IEEE C62.45.

D. Comply with NFPA 70.

E. All SPDs provided within this project at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

1.6 PROJECT CONDITIONS

A. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:
   1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
   2. Operating Temperature: 30 to 150 deg F.
   3. Humidity: 0 to 95 percent, non-condensing.
   4. Altitude: Less than 13,000 feet above sea level.

1.7 COORDINATION

A. Where field-mounted SPD's are specifically shown on plans, coordinate locations of field-mounted SPDs to allow adequate clearances for maintenance.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective

covering for storage and identified with labels describing contents.

1. Replaceable Protection Modules: 1 of each size and type installed, where field-replaceable modular SPDs are provided.
2. Fuses: 1 of each size and type installed, where field-replaceable fuses are provided.

PART 2 - PRODUCTS

2.1 SURGE PROTECTIVE DEVICES

A. Manufacturer:

1. Integral Devices: Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.), or by Surge Suppression Inc. if all of the performance of this specification are met and all UL listing of the equipment manufacturer are met.
2. External Devices (where specifically specified on plans): Surge Protective Devices shall be as manufactured by the distribution equipment manufacturer (Square D, etc.) or Surge Suppression Inc.

B. Each Surge Protective Device shall:

1. Be internal to the associated distribution equipment (without violating any applicable UL listings) unless specifically shown otherwise on plans.
2. Be UL 1449 (Latest Edition) listed.
3. Have short-circuit current rating complying with UL 1449 (Latest Edition), that matches or exceeds the short-circuit rating of the associated distribution equipment.
4. Be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
5. Have fuses, rated at 200-kA interrupting capacity.
6. Have a minimum UL 1449 Nominal Discharge Current (I_n) Rating of 20kA.
7. Be fabricated using bolted compression lugs.
8. Provide suppression for all ten (10) modes of protection.
9. Have LED indicator lights for power and protection status of each phase.
10. Have audible alarm, with silencing switch, to indicate when protection has failed.
11. Have form-C contacts rated at 2 A and 24-V ac minimum, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with facility monitoring and control system if monitoring by that system is required by plans or other specifications.
12. Have six-digit transient-event counter, mounted to front of equipment door, set to totalize transient surges (externally mounted SPD's may have the transient –event counter monted on the visible face of the SPD).
13. Meet all UL 96A requirements (for Lightning Protection Systems) where the device is installed at a service entrance of the facility. At a minimum, these devices shall:
    a. Be marked as Type 1 or Type 2 SPDs with product Identity consisting of "Surge Protective Device" or "SPD", and identifying all ratings so required by UL96A and the 4 digit alpha numeric Control Number.
    b. Have a minimum UL 1449 Nominal Discharge Current (I_n) Rating of 20kA.
    c. Be UL listed and labeled with holographic label.

C. Peak Single-Impulse Surge Current Rating shall be meet the following minimums unless

specifically shown otherwise on plans:

Application	**Per Phase**	**Per Mode**
Service Entrance Devices	240 kA	120 kA
Downstream Devices	160 kA	80 kA

D. The ANSI/UL 1449 voltage protection rating (VPR) in grounded wye circuits, the SPDs shall not exceed the following:

Modes	**208Y/120V**	**480Y/277V**	**600Y/347V**
L-N,L-G, N-G	800	1200	1500
L-L	1200	2000	2500

E. The ANSI /UL 1449 VPR for 240/120 V, 3-wire or 4-wire circuits with high leg shall not exceed the following:

Modes	**240/120V**
L-N,L-G, N-G	1200/800

2.2 ENCLOSURES

A. Where external units are specifically specified on plans, units not mounted within electrical distribution equipment (such as switchboards, MCC's, etc.) shall be provided in enclosures with NEMA enclosure ratings that match or exceed the NEMA enclosure ratings of the equipment from which the units are fed. For example, a unit fed from a NEMA 4X stainless steel panelboard shall also be mounted within a NEMA 4X stainless steel enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All SPD's shall be integrally-mounted within the associated distribution equipment unless specifically shown otherwise on plans.

B. Install SPDs at service entrance on load side, with ground lead bonded to service entrance ground.

C. Install SPDs downstream of the service entrance with conductors or buses between suppressor and points of attachment as short and straight as possible. The lead lengths between the TVSS unit and the equipment being protected shall not exceed fourteen (14) inches without approval from the engineer. Do not bond neutral and ground. Leads shall be as straight as possible with no sharp bends.

D. Where externally-mounted SPD's are specifically shown on plans, provide circuit breaker as

directed by the SPD supplier as a dedicated disconnecting means for SPD unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. Ensure that interiors are free of foreign materials and dirt.

B. Check and test switches, pushbuttons, meters for proper operation.

C. Check and test indicating lights for proper operation and color.

D. Perform manufacturer's on site field test procedures.

3.3 STARTUP SERVICE

A. Do not perform insulation resistance (MEGGER) tests of the distribution wiring equipment with the SPDs installed. Disconnect all wires, including neutral, before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 SYSTEM WARRANTY

A. The SPD system manufacturer shall warranty the entire SPD system against defective materials and workmanship for a period of ten (10) years from the date of substantial completion. This warranty is in effect as long as the unit is installed in compliance with the manufacturer's installation, operation, and maintenance manual, UL Listing requirements, and any applicable national or local electrical codes.

B. Any SPD device which shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period which starts at the date of substantial completion of the system to which the surge suppressor is installed.

C. The manufacturer is required to have a nationwide network of factory-authorized local service representatives for repair and service of this product. The manufacturer shall have a dedicated 1-800 telephone number for service problems and questions. This number shall be manned by a knowledgeable factory employee to ensure prompt response to any emergency situation that may arise.

END OF SECTION 26 43 00

SECTION 26 50 00

LIGHTING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Lighting Fixtures

B. Drivers

1.2 SUBMITTALS

A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicated that the contractor/supplier intends to meet all contract requirements. Refer to specification section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.

B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.

C. All lighting fixtures shall be so designed and shall have drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor’s expense.

D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as required to maintain the fire rating of the assembly.

2.2 LED LUMINAIRES

A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the

lighting fixture.

B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.

C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.

D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.

E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.

F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.

G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

2.3 STEMS/PENDANTS

A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.

B. Stems/Pendants shall be rigid or IMC conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.

C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.

D. Shall be painted the same color as the fixture trim unless noted otherwise.

2.4 MANUFACTURER

A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.

B. Drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

A. Support:
1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.
2. Contractor shall coordinate installation requirements for all wall-mounted fixtures (especially for wall-mounted fixtures on uneven wall surfaces, etc.) as required to assure a

level/flat mounting surface and level/plumb/secure finished installation. Contractor shall provide flat mounting plates or other mounting provisions where necessary. Any proposed mounting plates, etc. shall be submitted to and approved by project architect prior to ordering materials.

3. Fixtures shall be supported independent of ceiling from structural members of building.
4. Lay-in fixtures shall be supported by four (4) taut 12 gauge hanger wires connected from each corner of the fixture to the structure above so that fixture is supported independent of the ceiling.
5. Other recessed light fixtures (including recessed downlights) shall be supported with two (2) taut 12 gauge hanger wires connected from opposing corners of the light fixture to the structure above so that fixture is supported independent of the ceiling.
6. Pendant mounted fixtures shall be directly supported from the structure above using a 9 gauge hanger wire or an approved alternate support without using the ceiling suspension system for direct support.
7. Tandem fixtures may utilize common hanger wires.
8. All lay-in fixtures shall be attached to ceiling grid by means of approved clips and in accordance with the N.E.C.
9. Contractor shall submit typical hanging detail to Engineer before installing any fixtures.

B. Connections:
1. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.
2. All flex shall contain 3 conductors (3rd wire ground). Ground wire shall be securely grounded at each end. Other conductors shall be connected by approved connectors.

C. Row-Mounted fixtures:
1. All stems on row-mounted fluorescent fixtures shall be installed as follows (except fixtures with slide grip hangers):
   a. One stem shall be installed in the first fixture knockout from end of row (on the first and last fixture of the row).
   b. One stem shall be installed between each two fixtures. Stem shall center joint where fixtures join and shall attach by use of "joining plates".
2. All fixtures in continuous rows other than recessed grid type shall be connected by nipples with locknuts bushings.

D. Coordination:
1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to ensure proper fit and coordination with other trades.
2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 26 50 00

SECTION 27 05 00

AUXILIARY SYSTEM CABLES, 0-50V

PART 1 - GENERAL

1.1 DESCRIPTION

A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless specified otherwise, all cables within the scope of this specification section shall:
1. Be rated for exposed cable tray installation.
2. Be plenum rated.
3. Be UL-rated for the proposed application.
4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
5. Utilize copper conductors.
6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.2 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:
1. Be rated for 600V.
2. Be industrial grade.
3. Have stranded conductors.
4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

2.3 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:
1. Be rated for 300V.
2. Be shielded if so recommended by the system supplier/integrator.
3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

2.4 NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Routing:
1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
   a. Cabling is plenum-rated, multi-conductor.
   b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
   c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
   d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
   e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
2. End bushings shall be provided on both ends of all raceway terminations.
3. No splices shall be pulled into conduit.
4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:
1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.
2. For cabling not installed in conduit:
   a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.
3. For cabling installed within conduit from endpoint to endpoint:
   a. Fire/smoke barrier penetrations shall sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.
4. For cabling installed within cable trays:
   a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:
      1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.

2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

C. Excess Cabling:
1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:
1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.2 SPLICES/CONNECTIONS/TERMINATIONS:

A. Network Cabling:
1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

B. Control Cabling:
1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

C. Shielded cabling:
1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.3 LABELING

A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00

SECTION 27 10 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 SCOPE:

A. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Backbone and Horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the structured cabling contractor as detailed in this document.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types are indicated on the plans. If the bid documents are in conflict, this specification shall take precedence.

D. Refer to Specification Section 26 05 53 (Electrical Identification) for additional identification requirements.

E. Refer to Specification Section 27 05 00 (Auxiliary System Cables, 0-50V) for additional material and installation requirements.

1.2 REGULATORY REFERENCES:

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the National Electrical Code, local ordinances and present manufacturing standards.

B. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. All modular jacks, patch cords, consolidation point, and patch cords shall be ETL Verified (not just tested) to be category 6 component and channel compliant.

D. The cabling system described in this specification is derived from the recommendations made in recognized telecommunications industry standards. The following documents are incorporated by reference:
   1. ANSI/TIA/EIA - 568-B.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements, April, 2001
   2. ANSI/TIA/EIA - 568-B.2, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components, April, 2001

3. ANSI/TIA/EIA - 568-B.2-1, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted Pair Cabling Components, Addendum 1 – Transmission Performance Specifications for 4-pair 100 Ω Category 6 Cabling
4. ANSI/TIA/EIA - 568-B.3, Commercial Building Telecommunications Cabling Standard Part 3: Optical Fiber Cabling Components, March, 2000
5. ANSI/TIA/EIA – 569-E, Commercial Building Standard for Telecommunications Pathways and Spaces, 2019
6. ANSI/TIA/EIA – 606-A, Administration Standard for Telecommunications Infrastructure of Commercial Buildings, February, 2002
7. ANSI/TIA/EIA – 607-AJ, Commercial Building Grounding and Bonding Requirements for Telecommunications, August 1994
8. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard, April 1999
9. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM) 10^{TH} edition.
10. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC) –2002
11. ANSI/TIA/EIA – 45-B, Test Procedures for Fiber Optic Connections.
12. ANSI/TIA/EIA – 526-14, Power Test for Fiber Runs.
13. FCC 47 CFR 68
14. NEMA 250
15. NEC Articles 770 and 800
16. ADA, Americans with Disabilities Act

E. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release.

F. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project. All local State and federal codes are to be followed.

1.3 APPROVED CONTRACTOR:

A. The Structured Cabling Contractor must meet the following requirements:
1. Contractor must have a certified RCDD on staff. The project manager for this project shall have an RCDD certification, and RCDD shall be responsible for reviewing all aspects of the design, submittals and installation of all products.
2. All required submittal information shall be stamped by the RCDD.
3. Contractor must have a minimum of 3 years experience with projects of similar size and scope to this project.
4. The company performing the work must have been in business for a minimum of 3 years.
5. The company must have an office within 75 miles of the job site.

B. The Structured cabling contractor is responsible for workmanship and installation practices in accordance with the requirements of the standards described in these specifications and manufacturer's requirements.

1.4 WORK INCLUDED:

A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.

B. The work shall include, but not be limited to the following:
1. Furnish and install a complete telecommunications wiring infrastructure.
2. Furnish, install, and terminate all UTP and Optical Fiber cable
3. Furnish and install all wall plates, jacks, patch panels, and patch cords at equipment racks and at work outlets (unless shown otherwise on plans).
4. Furnish and install all required cabinets and/or racks as required and as indicated.
5. Furnish any other material required to form a complete system.
6. Perform channel testing (100% of horizontal and/or backbone links/channels) and certification of all components.
7. Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.
8. Provide owner test results and documentation. (Testing documentation and As-built drawings)

1.5 SUBMITTALS:

A. Within thirty (30) days of notice to proceed the structured cabling contractor shall submit the following items:
1. Submit copies of the certification of the company and names of staff that will be performing the installation and termination of the installation to provide proof of compliance of this spec.
2. Submit proof from manufacturer of contractor's good standing in manufacturer's certification program.
3. Submit copy of contractor's RCDD certification.
4. Submit listing of five (5) projects of similar size and scope to this project that have been completed within the last five years. Include in this submittal owner's contact information for each project.
5. Submit letter from the manufacturer stating that the manufacturer will provide a twenty-five year (25) warranty in accordance with the requirements paragraph 1.03 (B) of these specifications.
6. Submit appropriate cut sheets and samples for all products, hardware and cabling.
7. Submit 1/8" = 1'-0" drawings of floor plans indicating all work outlets and the labeling designation for each jack.
8. Submit ½" = 1'-0" drawings of each MDF and each IDF showing all racks, patch panels, 110 blocks, etc.

B. Work shall not proceed without the engineer's approval of the submitted items.

C. The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

1.6 DRAWINGS:

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS:

A. Due to the nature and type of communications all products, including but not limited to faceplates, jacks, patch panels, racks, 110 blocks, and patch cords, for the purpose of this document, shall be manufactured by Hubbell, Ortronix, Panduit, Amp or Systimax. See below for acceptable cable manufacturers.

2.2 WORK AREA OUTLETS:

A. Work area cables shall each be terminated at their designated work area location in the connector types described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.

B. The Telecommunications Outlet Assembly shall accommodate:
1. A minimum of two (2) modular jacks
2. Additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary
3. A blank filler will be installed when extra ports are not used.
4. A dust cap shall be provided on all modular jacks with the circuit number on the identifier strip.
5. Multiple jacks will be placed as documented on the plans.
6. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the structured cabling contractor shall submit the proposed configuration for each outlet assembly for review by the architect.
7. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA-606-A standard specifications. Labels shall be printed using a printer such as a Brady hand held printer. Hand printed labels shall not be accepted.

C. Faceplates: The faceplates shall:
1. be UL listed and CSA certified.
2. be constructed of stainless steel (except where noted otherwise). All faceplate colors/materials in public areas shall be approved by the architect. In all cases the material and color of the faceplate shall match the adjacent electrical faceplate.
3. (where plastic faceplates are specifically allowed by the architect/engineer) shall match the faceplate color used for other utilities in the building or match the color of the raceway if installed in surface raceway.
4. be compliant with the above requirements along with the following when incorporating optical fiber:

a. be a low profile assembly,
b. incorporate a mechanism for storage of cable and fiber slack needed for termination,
c. position the fiber optic couplings to face downward or at a downward angle to prevent contamination and,
d. incorporate a shroud that protects the optical couplings from impact damage.

5. be available as single-gang or dual-gang.
6. possess recessed designation windows to facilitate labeling and identification.
7. shall include a clear plastic cover to protect labels in the designation window.
8. have mounting screws located under recessed designation windows.
9. comply with ANSI/TIA/EIA–606-A work area labeling standard.
10. allow for the UTP modules to be inverted in place for termination purposes.
11. be manufactured by an ISO 9001 registered company.

D. Voice / Data Jacks

1. Voice/Data jacks shall be 8-position modular jacks and shall be Category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-B.2-1. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory including, but not limited to, ETL.
2. The wiring scheme shall be T568A or T568B as directed by the owner.
3. The modular jack shall use dual reactance modular contact array.
4. The modular jack shall have low emission IDC contacts.
5. The modular jack shall use standard termination practice using 110 impact tool
6. The modular jack shall be backwards compatible to Category 3 and 5.
7. The modular jack shall be center tuned to category 6 test specifications.
8. Dust cover shall be used on each termination.

2.3 110 COPPER TERMINATION BLOCK:

A. The voice cross connect shall be a passive connection between the horizontal termination blocks and the backbone termination blocks. The wall mount frames shall be field terminated kits including all blocks, connecting blocks, and designation strips. Management rings shall be mounted between vertical columns of blocks to provide management of cross-connect wire. Backbone and horizontal blocks shall use 4-pair connecting blocks. Blocks shall be oriented so that backbone terminations are located on the left and horizontal frames are located on the right of the termination field when facing the frame assembly.

B. 110 Block Kits shall

1. include both the wiring block and connecting block in a 50, 100 and 300 pair footprint as required
2. be manufactured using fire retardant molded plastic.
3. include 4-pair 110C connecting blocks for field termination.
4. support termination of 22-24 AWG solid conductor
5. wiring blocks shall contain back openings for the feed through of cable
6. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
7. have color-coded tips on the wiring block and color coding on the connector blocks for installation identification.
8. shall use standard termination practice requiring a single conductor 110 impact tool

9. Termination hardware shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
10. be backwards compatible to category 3 and 5.
11. be labeled in compliance with ANSI/TIA/EIA-606-A labeling specifications using permanent labels and label printer.
12. be manufactured by an ISO 9001 registered company.

2.4 MODULAR PATCH PANELS:

A. The Modular Patch Panels shall
1. be modular design.
2. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
3. use low emission IDC contacts
4. use dual reactance technology to enhance the signal-to-noise ratio
5. require standard termination practices using a 110 impact tool
6. use a single piece IDC housing designed to accept larger Category 6 conductors
7. support both T568B and T568A wiring
8. include easy to follow wiring labels
9. include label fields
10. allow for the use of icons
11. include full length metal rear cable management
12. be available in standard or high density
13. be backward compatible to category 3 and 5.
14. be center tuned to category 6 test specifications
15. be sized to accommodate number of data or data and phone cables (where phone cables are terminated on patch panels in lieu of 110 blocks) served by each equipment room plus 30% spare capacity.
16. be separated by horizontal cable management sections.

2.5 RACKS:

A. The equipment rack 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.

B. 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. Double-sided wire management shall also be mounted above each patch panel and/or piece of equipment on the rack. The rack shall include mounting brackets for cable tray ladder rack 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.

C. Free-Standing Racks shall:
1. have the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
2. have top cable trough with waterfall and built in patch/horizontal cable distribution separator.

3. have horizontal front and rear cable management above, below and between each 48-port patch panel.
4. have a rack-mounted power strip.
5. have EIA hole pattern on front and rear.
6. be available with a 6.0" channel depth.
7. be available with hook and loop straps for securing bulk cables inside the vertical U-channels.
8. assemble as 19" (483 mm) or 23" (584 mm) with no additional hardware.
9. be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.
10. provide floor and ceiling access for cable management and distribution.
11. provide pre-drilled base for floor attachment of rack.
12. be available in standard color of black.
13. be manufactured by an ISO 9001 registered company.

D. Wall-Mounted Racks shall:
1. provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
2. have top cable trough with waterfall and built in patch/horizontal cable distribution separator.
3. have horizontal front and rear cable management above, below and between each 48-port patch panel.
4. have a rack-mounted power strip.
5. have EIA hole pattern on front and rear.
6. be available with a 6.0" channel depth.
7. be available with hook and loop straps for securing bulk cables inside the vertical U-channels.
8. assemble as 19" (483 mm) or 23" (584 mm) with no additional hardware.
9. provide usable depth as required for standard network ethernet switch and other equipment
10. be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.
11. provide floor and ceiling access for cable management and distribution.
12. provide pre-drilled base for wall attachment of rack.
13. be available in standard color of black.
14. be manufactured by an ISO 9001 registered company.
15. be constructed to swing-out from wall (for rear access) via heavy-duty hinged corner and configurable for either left or right opening.

2.6 HORIZONTAL DISTRIBUTION CABLE:

A. Horizontal Distribution Cabling shall meet the following requirements:
1. Shall be 100 Ohm Enhanced Category 6 Unshielded Twisted Pair (UTP) Cable.
2. Physical Characteristics:
   a. Unless directed otherwise by owner (contractor shall verify with owner), Cat6 cable coloring shall be based on system type as follows, unless specifically approved otherwise:
      1) Data (or IP Voice): Blue
      2) Analog Voice: Grey
      3) Lighting Control System: White

4) Fire Alarm or other Life-Safety System: Red
5) CCTV Surveillance Cameras: Yellow
6) Other: As directed by owner

b. Shall be plenum-rated.
c. Shall meet applicable requirements of ANSI/ICEA S-80-576.
d. The diameter of the insulated conductor shall be .023 in. maximum.
e. Shall consist of (4) 22-26 AWG twisted pairs.
f. The overall diameter of the cable shall be no larger than 0.240 inches.
g. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.
h. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
i. Cable shall be third party verified to meet ANSI/TIA/EIA-568-B.2-1.
j. Where installed underground, within slab-on-grade or in exterior locations, be gel-filled and rated for wet locations.

3. Transmission Characteristics:
   a. DC resistance of any conductor shall not exceed 9.38 Ohms per 100m max. at 20^{o} C. Measured in accordance with ASTM D 4566.
   b. The mutual capacitance of any pair at 1 kHz for 100m of cable shall not exceed 4.4 nF nominal.
   c. DC resistance unbalance any two conductors of any pair shall not exceed 5% when measured at or corrected to 20° C in accordance with ASTM D 4566.
   d. Structural return loss swept measurement for 100m or longer shall meet or exceed Category 6 requirements.
4. Shall be manufactured by Amp NetConnect, Berk-Tek, Leviton, General Cable, Mohawk or Superior Essex.

2.7 BACKBONE - FIBER:

A. Backbone Fiber Optic Cabling shall meet the following requirements:
   1. All optical fiber shall be Indoor/Outdoor,Tight-Buffered, All-Dielectric, Plenum rated (unless specified otherwise on plans) with Enhanced Multimode OM4-rated 50/125 Optical Fibers.
   2. Each Multimode Fiber shall:
      a. Be graded-index optical fiber wave-guide with nominal 50/125µm-core/cladding diameter.
      b. Comply with ANSI/EIA/TIA-492AAAC-A
      c. Have attenuation measured in accordance with ANSI/EIA/TIA-455-46, 53 or 61.
      d. Have information transmission capacity measured in accordance with ANSI/EIA/TIA-455-51 or 30.
      e. Have measurements performed at 23 degrees C +/- 5 degrees.
      f. Have Maximum attenuation dB/Km @ 850/1300 nm: 3.5/1.0
      g. Have bandwidth $\geq$ 4700 MHz-km @ 850nm. (EMB)
      h. Have bandwidth $\geq$ 500 MHz-km @ 1300nm.
      i. Be laser optimized and guarantee a 1 Gb/s distance of 1000 meters @ 850nm and 10 Gb/s at 600 meters @ 850nm.
      j. Terminate on fiber patch panel using SC Type fiber connectors.
   3. Each indoor/outdoor fiber optic cable shall:
      a. Be suitable for use in both outdoor and indoor applications without the use of a transition at the building entrance.

b. Be suitable for use in risers, plenums and horizontal applications.
c. Have a dry water blocking system for cable.
d. Have a fiber strand count of 12 (unless shown otherwise on plans).
e. Have a nominal 2.21 mm sub-unit diameter.
f. Have and be marked with an UL-OFNP Flame Rating (unless engineer specified otherwise on plans).
g. Comply with Bellcore GR-409 and GR20
h. Be independently verified to comply with ICEA S-104-696
i. Have strength members of FGE/Aramid yarn.
j. Be suitable for underground or above ground conduits.
k. (Where applicable) Have Tight Buffered fibers color coded in accordance with EIA / TIA 598 with an overall black jacket.
l. Be suitable for operation between -40° to +70° C
m. Be UV resistant
n. Be of an all dielectric design

4. Shall be manufactured by Berk-Tek, Corning, General Cable or Superior Essex.

2.8 BACKBONE - COPPER:

A. Backbone Copper Cabling shall meet the following requirements:
1. Shall be Cat 3 rated.
2. Shall be RDUP PE-39 rated.
3. Where installed underground or in wet locations, shall include fully-flooded waterblocking compound to provide wet-location rating of cable.
4. Size of the backbone cables shall be determined by multiplying the number of horizontal voice cables to be terminated in each IDF by 200% and rounding up to the nearest 50 pair group. For Example if 94 horizontal voice cables are to be terminated in IDF1, install 94 x 1 pr x 200% = 188 pr rounded up to nearest 50 pr = 200 pr cable to IDF1.
5. Shall be manufactured by Berk-Tek, Corning, General Cable, Mohawk or Superior Essex.

2.9 COPPER CABLE SURGE PROTECTION DEVICES:

A. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end. The surge protection device shall be labeled as meeting the requirements of the latest edition of UL 96A (exact requirements shall be coordinated with the lightning protection system supplier, where applicable).

B. The surge protection device shall be connected with a #6 AWG copper bonding conductor between the protector ground lug and the TC ground point.

2.10 PATCH CORDS:

A. The structured cabling contractor shall provide factory terminated and tested UTP and optical fiber patch cords and equipment cords for the complete cabling system. Patch cords shall be provided by the structured cabling contractor to connect patch panels to owner furnished electronics. The UTP patch cables shall meet the requirements of ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 for patch cord testing. Provide one set of optical fiber patch cables per fiber run that terminates on fiber patch panel and provide one category 6 patch cord for each category 6 work outlet that terminates on patch panel.

B. Copper (UTP) patch cords shall:

1. Be furnished to connect each patch panel jack to owner supplied electronics.
2. Be furnished for each work outlet jack.
3. Be a Category 6 patch cord manufactured by Panduit, Amp or Systimax.
4. Use 8 position connector with impedance matched contacts and designed using dual reactance.
5. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2–1 standard.
6. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1 100% factory tested to meet category 6 performance and ETL or any other nationally recognized 3rd party verification
7. Be capable of universal T568A or T568B wiring schemes.
8. Have modular connector that shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
9. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
10. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
11. Have "snagless" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief
12. Be available in three standard colors
13. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths
14. Be backwards compatible to Category 3, 5 and 5e

C. Fiber Optic patch cords shall:
1. Be furnished in the quantity of two (2) per IDF in each IDF and two (2) per IDF in each MDF.
2. Be manufactured by Panduit, Amp or Systimax.
3. Be multimode OM4 type.
4. Have connector type as directed by owner.
5. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
6. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
7. Be available in three standard colors
8. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths

2.11 GROUNDING AND BONDING:

A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.

B. The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications room shall be provided with a telecommunications ground bus bar (TGB). Each grounding bus shall be 12"W x 4"H x ¼"THK and be mounted to the backboard with porcelain isolators.

C. All wires used for telecommunications grounding purposes shall be identified with a green

insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

2.12 FIRESTOP:

A. A firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an UL listed firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

2.13 INNERDUCT:

A. Innerduct, shall be:
1. Non-metallic, corrugated with pre-installed pull tape.
2. Plenum-rated, where installed within buildings.
3. UL listed for the application.
4. Size as required by the application.
5. Orange in color in concealed areas or within telecommunications or electrical rooms. Color shall be custom as selected by owner in exposed areas (such as within cable trays overhead in areas without ceilings outside telecommunications/electrical rooms).

PART 3 - EXECUTION

3.1 PRE-INSTALLATION SITE SURVEY:

A. Prior to start of work, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial schedule completions of the equipment rooms and telecommunication closets.

B. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

3.2 WORK AREA OUTLETS:

A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

B. Cables shall be dressed and terminated in accordance with the recommendations made in the

ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.

C. Pair untwist at the termination shall not exceed 12 mm (one-half inch).

D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the cable.

E. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.

F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).

G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.3 HORIZONTAL DISTRIBUTION CABLE INSTALLATION:

A. All horizontal voice and data cabling shall be terminated on modular patch panels except for horizontal voice cables serving life safety related functions (fire alarm systems, security systems, elevator communications, etc.). All horizontal voice cabling serving life safety related functions shall be terminated on 110 blocks.

B. The voice and data cables shall be installed in separate patch panels.

C. All wiring above ceilings shall be installed in cable tray or open top cable hangers or in provided conduit.

D. Cable above accessible ceilings shall be supported 60” on center from cable support attached to building structure.

E. Do not untwist cable pairs more than 0.5 in. when terminating.

F. The Contractor shall be responsible for replacing all cables that do not pass Category 6 requirements for data and 5e for the voice applications.

G. Maximum horizontal cable length shall be 90 meters.

H. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

I. Install cable in neat and workmanlike manner. Neatly bundle and tie all cable in closets. Leave sufficient cable for 90° sweeps at all vertical drops.

J. Do not install Category 6 cable with more than 110N (25 lbs) pull force, as specified in ANSI/TIA/EIA and BICSI TDDM practices. Utilize appropriate cable lubricant in sufficient quantity to reduce pulling friction to acceptable levels on long pulls inside conduit, pulls of multiple cables into a single small bore conduit, on conduit runs greater than 100 lineal feet with bends of opposing directions, and in conduit runs that exceed 180 degrees of accumulated

bends. Use of tensile rated cords (i.e. fishing line) should be used for difficult or questionable pulls - to judge to go/no-go condition of the conduit and pulling setup.

K. Cables jackets that are chaffed or burned exposing internal conductor insulation or have any bare copper ("shiners") shall be replaced.

L. Test, label and document as called for in contract documents.

M. Firestop all openings where cable is installed through a fire barrier.

3.4 HORIZONTAL CROSS CONNECT INSTALLATION:

A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).

C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

D. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

E. The cable jacket shall be maintained as close as possible to the termination point.

F. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.5 OPTICAL FIBER TERMINATION HARDWARE:

A. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

C. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

D. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

E. A maximum of 12 strands of fiber shall be spliced in each tray

F. All spare strands shall be installed into spare splice trays.

3.6 BACKBONE CABLE INSTALLATION:

A. Raceways:
   1. All backbone cables shall be installed inside innerducts (see specification above) within conduits meeting specification requirements unless specifically noted otherwise.
   2. Backbone cables shall be installed separately (in separate innerducts/conduits) from horizontal distribution cables.
   3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
   4. Where backbone cables and distribution cables are specifically specified to be installed in a cable tray or wireway, backbone cables shall be installed first, within innerducts meeting specifications above, bundled separately from the horizontal distribution cables.

B. Support:
   1. Within Telecommunications Rooms or at Telecommunications Backboards, all backbone cables shall be securely fastened to the backboards on the walls.
   2. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
   3. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
   4. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

3.7 COPPER TERMINATION HARDWARE:

A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-A/B standard, manufacturer's recommendations and best industry practice.

B. Pair untwist at the termination shall not exceed 12 mm (one-half inch).

C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

D. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

E. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.

F. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.8 RACKS:

A. Floor-mount racks shall be used unless specifically shown otherwise.

B. Floor-mount racks shall be securely attached to the concrete floor using a minimum 3/8” hardware or as required by local codes.

C. Racks shall be placed with a minimum of 36 inches clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

D. All racks shall be grounded to the telecommunications ground bus bar in accordance with Section 3.11 of this document.

E. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

F. Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with two coats of grey fire retardant paint.

G. Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.

H. Rack-mounted patch panels (and the associated horizontal cable management sections) furnished within the contract shall occupy no more than 40% of the available space within the associated racks (also furnished within the contract) unless specifically shown or specified otherwise. A minimum of 60% of available rack space shall be reserved for owner-furnished equipment. Where the number of patch panels and horizontal cable management sections would exceed 40% of the available rack space, an additional rack shall be installed.

3.9 EQUIPMENT TRAY FOR TELECOMMUNICATION ROOMS:

A. All equipment trays shall be 18" in width.

B. Furnish and install 18" equipment tray from each floor mount rack/server cabinet to wall. Furnish 18" equipment tray around wall as required to support cables. A minimum of two (2) walls shall be completely covered by equipment tray.

C. Furnish and install cable retaining posts on each side of tray every 4 feet as required to supports cables.

3.10 FIRESTOP SYSTEM:

A. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.11 GROUNDING SYSTEM:

A. The TMGB in the MDF shall be connected to the building electrical entrance grounding facility with a #6 AWG ground. Each TBB in each IDF shall be connected to a ground bus in the MDF with #4/0 AWG minimum ground. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

B. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the TR or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.

C. The TBB shall adhere to the recommendations of the ANSI/TIA/EIA-607 standard, and shall be installed in accordance with best industry practice.

D. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by the electrical contractor.

3.12 IDENTIFICATION AND LABELING:

A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful structured cabling contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.

B. All label printing will be machine generated by Panduit software (or other) using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.13 TESTING AND ACCEPTANCE:

A. General
1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Panduit Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing
1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance, respectively.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B.1 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
4. Category 6 Performance:
   a. Follow the Standards requirements established in:
      1) ANSI/TIA/EIA-568-B .1, B.2 and B.2-1
   b. A Level III test unit is required to verify category 6 performance.The basic tests required are:
      1) Wire Map
      2) Length
      3) Attenuation
      4) NEXT (Near end crosstalk)
      5) Return Loss
      6) ELFEXT Loss
      7) Propagation Delay
      8) Delay skew
      9) PSNEXT (Power sum near-end crosstalk loss)
      10) PSELFEXT (Power sum equal level far-end crosstalk loss)

C. Fiber Testing
1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the structured cabling contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The structured cabling contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

3.14 SYSTEM DOCUMENTATION:

A. Upon completion of the installation, the structured cabling contractor shall provide three (3) full documentation sets to the owners for approval. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and

draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the structured cabling contractor shall provide copies of the original test results.

C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the structured cabling contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

3.15 TEST RESULTS:

A. Test documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

B. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-A/B including applicable TSB's and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.

C. Test results generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The structured cabling contractor must furnish this information in electronic form (CD-ROM).

D. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

3.16 AS-BUILT DRAWINGS:

A. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD rel. 2002) formats on which as-built construction information can be added. These documents will be modified accordingly by the structured cabling contractor to denote as-built information as defined above and returned to the Owner.

B. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD DWG) form.

3.17 WARRANTY:

A. The manufacturer shall provide a 25 year extended product warranty with a 25 year applications assurance warranty. Manufacturer shall provide the warranty directly to the end user.

B. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for 25 years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal copper and the backbone optical fiber portions of the cabling system.

C. The Application Assurance Warranty shall cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA–568-B.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, and 155 Mb/s ATM.

D. The contractor shall provide a warranty on the physical installation.

3.18 FINAL ACCEPTANCE & SYSTEM CERTIFICATION:

A. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from the manufacturer, registering the installation.

END OF SECTION 27 10 00

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install a complete low voltage, automatic and manual fire alarm system as specified herein and indicated on the drawings.

B. The system shall include a central control panel, power supply, signal initiating devices, audible and visual alarm devices, a conduit and wiring system and all necessary accessories required to provide a complete operating system.

C. The system shall be completely addressable.

D. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 (National Fire Alarm Code) for fire alarm systems; N.E.C. Article 760; and meet all requirements of the local authorities having jurisdiction.

E. The system shall be provided by a local service organization located within 50 miles of the job site.

1.2 DESCRIPTION OF SYSTEM

A. Conduit, outlet boxes, cabinets, devices and wiring installation for complete fire detection and alarm system.

B. Each and every item of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriter's Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOBZ as a single control unit. Partial listing shall not be acceptable. System controls shall be UL listed for Power Limited Applications per N.E.C. Article 760. All circuits shall be marked in accordance with N.E.C. 760-23.

C. Wiring shown is diagrammatic to define system and is not intended to show every wire. Review drawings prior to bidding and inform Contractor of any additional wiring necessary for installation of systems. Wiring shall comply with pathway survivability requirements defined in NFPA 72. Include cost of all wiring in bid.

D. Submit complete shop drawings of system for review including terminal to terminal connection diagrams for system components and associated equipment interfaces, conduit diagrams, complete descriptive information on each item of equipment including UL listing for all system components, and any other information required by Architect to describe system. Identify color code and terminal numbers on shop drawings.

E. After completion of work, submit one set of record mylar sepias with items for Owner described above. Typical type drawings will not be accepted.

F. Manufacturer's trained technical representative shall supervise installation, connections and tests. The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring. Before acceptance, manufacturer's representative will test and certify in writing that system is installed and functioning properly as intended by drawings and specifications. Test includes operation of all devices in entire system.

G. Guarantee entire system in writing for one year from date of acceptance by Owner. Guarantee will cover completely all components, equipment, wiring, etc. Repair any defects found in the system within the guarantee period without cost to owner.

H. Submit with bid a guaranteed price for complete maintenance and service of system for one year beginning at expiration of guarantee period. Price shall be guaranteed for acceptance by Owner until date of substantial completion of system.

1.3 SYSTEM OPERATION

A. Actuation of any alarm initiating device shall cause all audible alarm signals to sound, all visual indicating appliances to flash, activate an alarm LED and local tone-alert at control panel/annunciator, cause an LCD read-out of point in alarm including type of alarm (smoke detector, manual station, etc.), provide a signal to the mechanical controls to shut down or re-route air handling systems according to established plans. This shall include a suitable addressable relay at each air handling unit to shut down all air handlers in a given zone when system goes into alarm.

B. The general alarm devices may be silenced by authorized personnel only, by entering a locked cabinet and operating the proper silencing switch. A subsequent zone alarm shall reactivate the signals. Operation of the silencing switch shall be indicated by a trouble light and audible signal.

C. Operation of any sprinkler monitoring switch, power failure, opens, grounds, or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced; however, the trouble LED shall remain lit until the system has been returned to normal operating condition.

D. Analog Smoke Sensor Operation
1. The smoke sensor shall be a smoke density measuring device having no self contained alarm set-point. The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to stored values.
2. The control panel shall maintain a moving average of the sensors smoke chamber value. Systems that do not automatically maintain a constant smoke obscuration sensitivity for each sensor by compensating for environmental factors and are deemed unacceptable.
3. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor’s average value reaches a predetermined value, a “Dirty Sensor” trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location.
4. If a “Dirty Sensor” is left unattended, and its average value increases to a second predetermined value, an “Excessively Dirty Sensor” trouble condition shall be indicated at the control panel for the individual sensor.

5. The control panel shall automatically perform a daily self-test on each sensor. Checking the electronics in the sensor's base ensures the accuracy of the values being transmitted to the control panel. A sensor which fails the self-test will cause a "Self Test Abnormal" trouble condition at the control panel. A sensor self-test which must be manually initiated by the operator shall not be acceptable.

1.4 SYSTEM FEATURES

A. The fire alarm system shall include the following features as a minimum:
1. Supervision of all field wiring.
2. Microprocessor based solid state modular construction.
3. Ground fault detection and ground fault isolating & supervising circuitry.
4. 80 character LCD display to indicate alarms, supervisory service conditions and troubles.
5. Simultaneous test of all LED's and LCD's from a central point.
6. "Dead Front" design control panel/annunciator with field programmable LED alarm, status and trouble indicators, and all control switches located behind a locked tempered glass door.
7. Fully automatic battery charger and lead alkaline batteries. Batteries shall have capacity to maintain system operation for 24 hours in normal supervisory mode and shall have sufficient capacity remaining to operate in alarm mode for 15 minutes at conclusion of supervisory period. Batteries shall be supervised for connection to the system and for low voltage threshold. Ammeter and voltmeter shall be provided to indicate battery voltage and charging current.
8. Two (2) sets of 2 amp form C auxiliary alarm contacts fused with feedback.
9. One (1) set of 2 amp form C auxiliary trouble contacts.
10. Standard with 127 addressable points (expandable to 508 points) and four input/output (I/0) circuits (expandable to 20 circuits).
11. Basic four (4) amp power supply (expandable as required).
12. 600 event historical logging.
13. System shall be field programmable for offsite monitoring by remote station reverse polarity, local energy master box or shunt master box types.
14. System shall be field programmable for signal circuit type of operation; march time code, temporal code, selective code, zone code, general alarm, time limit cutout and alarm silence inhibit.
15. System shall be field programmable for waterflow/sprinkler supervisory operation on distinct zones as required.
16. Transient suppression protection shall be provided on the system power supply and on the municipal protection circuit to comply with UL 864 requirements. Additionally, surge suppression shall be provided within the control panel on all circuits that extend outside the building (including to roof-mounted HVAC units).
17. Supervised remote annunciator connection circuit.
18. System shall incorporate an alarm/trouble walk test.
19. Resident non-volatile programmable operating system memory for all operating requirements.

B. Control panel shall be furnished with one-way voice communication and tone generating capabilities.
1. A central audio control shall be provided for the necessary alarm message/tone generation, main and remote microphone connections and mixer/pre-amplifier circuits. Continuous supervision shall be provided. Audio outputs shall have individual gain control.

2. A hand held, push-to-talk microphone shall be provided recessed within a protective panel mounted enclosure. The microphone shall be a dynamic communication type with a frequency range of 200HZ to 4000Hz and shall be equipped with a self-winding five foot coiled cable. An LED indicator shall be provided to indicate microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. Microphone shall be supervised from disconnection.
3. An audio control switch module shall be furnished to provide manual switches to the audio functions. Switches and associated LED indicators shall be supervised for disarrangement or failure.
4. Audio power amplifiers shall be furnished with self-contained filtered 24VDC power supply, transformer and amplifier monitor circuits. Amplifiers shall provide a 25VRMS output with a frequency response of 120 Hz to 12KHz. Provide a sufficient quantity of amplifiers to operate all system speakers simultaneously plus ten (10) percent space capacity. Amplifiers shall be sized to accommodate all speakers tapped at two watts. Provide one (1) back-up amplifier capable of automatically replacing any failed amplifier.
5. Speaker circuits shall be supplied which are capable of supplying audio signals at 25VRMS supplied by the system amplifiers. Supervision for open, short or ground fault conditions shall be provided. Individual and distinct trouble indications shall be provided for each fault.
6. Digitized tones for alarm or auxiliary requirements shall be provided.
7. A remote microphone/annunciator (LCD type) command location as shown on plans shall be provided to duplicate the manual voice transmission capability of the fire alarm control panel.
8. The system shall be configured to allow selective voice paging. If any manual control switches are activated, the control panel operator shall be able to make announcements via the paging microphone over the pre-selected speakers. Facility for total building evacuation and paging shall be provided to allow for activation of speakers. This shall be accomplished by an “All Call” switch.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANELS/ANNUNCIATORS

A. Furnish and install Simplex type 4020-9101 fire alarm control panel(s) with options and accessories as required.

2.2 MANUAL ALARM STATIONS

A. Manual alarm stations shall be Simplex addressable type 4099-9002 break glass (double-action). The station body shall be so constructed that chips and scratches will not expose metal. All stations shall be master keyed with the control equipment. When actuated, the "Pull Lever" shall remain at right angle to the station body until reset.

B. Boxes:
1. Recessed, two-gang outlet boxes with Simplex type 2099-9813 red, semi-flush trim plates shall be used where possible.
2. Where surface-mount outlet boxes are required, boxes shall be red, cast aluminum Simplex type 2975-9022.

2.3 PHOTOELECTRIC SMOKE SENSOR

A. The smoke sensors shall be of the photoelectric addressable Simplex type 4098-9714 and shall communicate actual smoke chamber values to the system control panel. The smoke sensors shall operate on the light scatter principle. For maximum maintenance free service and low power requirement, light source for detection chamber and visual alarm indication shall be solid state photodiode.

B. Each sensor base shall be visually and electrically supervised.

C. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

D. Each sensor base shall contain integral addressable electronics and an LED that will flash each time it is scanned by the control panel (once every 4 seconds). The control panel shall be responsible for drift compensation. When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Sensor bases shall be compatible with detachable photoelectric, ionization and heat sensors so that these various sensor types can be easily interchanged to meet specific location requirements. Sensor base shall be addressable type as required.

E. Where required, sensor bases shall be provided with a relay driver output and supervised relay, which are to be controlled either automatically or manually from the control panel.

F. Each sensor base shall be scanned by the control panel for its type identification to prevent inadvertent substitution of the wrong sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

G. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

H. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

I. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.

J. Provide a U.L. listed sensor guard for sensors in areas subject to tampering. The guard shall be suitable for ceiling or sidewall mounting and hinged for easy access. The guard shall be securely mounted with tamper-proof screws.

2.4 PHOTOELECTRIC DUCT DETECTOR

A. The detector shall be an addressable, non-polarized 24VDC, Simplex type 4098-9755, which is compatible with the Fire Alarm Control Panel and obtains its operating power from the supervisory current in the fire alarm detection loop. It shall be of the same analog type as the ceiling smoke detectors. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke

densities that are below the factory set alarm point. No radioactive material shall be used.

B. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector may be reset by actuating the control panel reset switch.

C. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contract between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel.

D. Sampling tubes sized to match duct size as recommended by equipment manufacturer shall be provided with duct detectors as required.

E. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). It shall be possible to alarm the duct housing by using a test switch. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

F. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.

G. Separate auxiliary SPDT relays for fan shutdown shall be provided with each duct detector for fan shutdown, smoke evacuation or other purposes as indicated on plans.

H. Remote key operated test stations with LED alarm indicators shall be installed in an accessible, inconspicuous location for each duct detector.

I. Duct detectors shall be installed for the equipment as indicated on plans as follows (locations shown on plans are diagrammatical only):
   1. A minimum of six duct widths downstream from bends or inlets to avoid air turbulence.
   2. On the downstream side of filters to detect fires in the filters.
   3. In return ducts, ahead of mixing areas.
   4. Upstream of air humidifier and cooling coil.
   5. With accessibility for test and service.

J. The following duct detector locations shall be avoided:
   1. Where dampers closed for comfort control would interfere with airflow.
   2. Next to outside air inlets (unless the intent is to monitor smoke entry from that area).
   3. In return air damper branch ducts and mixing areas where airflow may be restricted.

K. Where duct detectors are installed in exterior or wet locations, weatherproof duct housing enclosures shall be provided to protect the detectors. Enclosures shall be located to be in shaded areas rather than direct sunlight. Entire installation shall be as directed by the equipment manufacturer.

2.5 HEAT SENSORS

A. Heat sensors shall be U.L. listed, addressable Simplex type 4098-9733. They shall provide rate-of-rise temperature sensing, fixed temperature sensing (135 degrees F) and utility temperature

sensing (32 degrees F to 155 degrees F range).

B. Each sensor base shall be visually and electrically supervised.

C. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

D. Each sensor base shall contain integral addressable electronics and an LED that will flash each time it is scanned by the control panel (once every 4 seconds). The control panel shall be responsible for drift compensation. When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Sensor bases shall be compatible with detachable photoelectric, ionization and heat sensors so that these various sensor types can be easily interchanged to meet specific location requirements. Sensor base shall be addressable type as required.

E. Where required, sensor bases shall be provided with a relay driver output and supervised relay, which are to be controlled either automatically or manually from the control panel.

F. Each sensor base shall be scanned by the control panel for its type identification to prevent inadvertent substitution of the wrong sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

G. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

H. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

I. Heat sensor shall be automatically restorable.

2.6 MAGNETIC DOOR HOLDERS

A. Provide Simplex type 2088 series magnetic door holders as required where shown on plans.

2.7 ALARM SIGNALS (AUDIBLE)

A. Speakers:
1. Alarm speakers shall be Simplex type 4902-9805. The speakers shall be polarized and shall be operated by 25VRMS. Each speaker assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall NOT be accepted. Where speakers are shown as a combination audible-visual assembly, they shall be mounted as a combination unit in a single back box (4906 series) . Speakers shall be capable of producing 88dB and shall be tapped for 2 watt connection.
2. Cluster speakers in gymnasium shall be horn loudspeakers rated for 15 watts with UL 1480 listing for fire alarm speakers. Speaker shall have tap settings at 2, 4 7.5, and 15 watts.

B. Devices required to be surface mounted shall be furnished with Simplex type 2975-9145 surface

mounting box and 4905-9903 adaptor plate.

C. Devices installed in areas subject to mechanical damage (ie. gymnasiums) shall be furnished with suitable wire guards as indicated on plans.

2.8 ALARM SIGNALS (VISUALS)

A. Visual Flashing Lamps (Xenon Strobe):
1. Furnish and install per plans and specs Simplex type 4904 series visible appliance for fire alarm system notification. The appliance shall be 1HZ synchronized (15cd, 30cd, 110cd) with polar distribution or 75 cd illumination as required by the Americans with Disabilities Act (ADA). The appliance shall be U.L. listed to Standard 1971 and have a circumpolar light output allowing mounting in either vertical or horizontal positions or on the ceiling.
2. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the light pattern in key axis directions.
3. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8 inches. In its quiescent state, the word "FIRE" shall be visible.
4. Mounting heights of visual appliances shall in all respects comply with the Americans with Disabilities Act.
5. Visual indicating appliances shall be Simplex type 4904 series and comprised of a Xenon flashtube and be entirely solid state. These devices shall be U.L. listed and be capable of either ceiling or wall mounting. The LEXAN lens shall be pyramidal in shape to allow better visibility. Visual units shall be of the stand alone type.

2.9 REMOTE MICROPHONE/ANNUNCIATOR

A. Where shown on the plans, provide and install an LCD annunciator. The annunciator(s) shall have a stainless steel finish and shall provide the same functionality as the main control panel front panel display. The annunciator shall communicate to the control panel over one twisted shielded pair of wire and operating power shall be 24VDC and be fused at the control panel. Point-wired annunciators will not be considered as equal.

B. The serial annunciator shall provide a common alarm and trouble circuit consisting of:
1. Control push-button switches – for alarm silence, trouble silence, system reset and manual evacuation duplicating the control panel switches. A key "enable" switch shall be provided to activate or deactivate the control switches.
2. Tone Alert – Duplicates the control panel tone alert during alarm and trouble conditions.
3. System trouble LED.
4. Power on LED.

C. To accommodate and facilitate job site changes the control switches shall have the capability to be programmed on site to provide for manual switch input operation other than their standard purpose.

2.10 SPRINKLER FLOW SWITCHES

A. Sprinkler flow switches and supervisory switches are provided under another section of these

specifications. This contractor shall be responsible for electrical connection of these devices to the fire alarm system.

2.11 SMOKE DAMPERS

A. Smoke dampers are provided under another section. This contractor shall be responsible for supplying a source of power and connecting them to the fire alarm system to close on alarm.

2.12 SYSTEM RECORD DOCUMENT CABINET

A. Furnish and install a documentation cabinet at the system control unit or other approved location. All final record documentation shall be stored in the cabinet. Cabinet shall be labeled as "SYSTEM RECORD DOCUMENTS". Cabinet shall include a 4 gigabyte digital flash drive interface with USB connector loaded with a digital copy of all system documentation including shop drawings and product data.

2.13 OFF SITE MONITORING

A. Furnish all material and labor to accomplish and coordinate with local company or fire department as necessary for off site monitoring of the Fire Alarm System. Transmission method(s) shall be as required by applicable codes and Authority Having Jurisdiction (AHJ). Off site monitoring shall be in operation prior to final acceptance. Exact type of off site monitoring (basic reporting or advanced reporting as described below) shall be provided by the contractor per the owner's direction.

B. Furnish and install serial digital alarm communicating transmitter (DACT), capable of reporting specific alarm points to the central station. DACT shall be universal in that it can be utilized to either provide basic reporting (alarm, trouble, supervisory conditions) or more advanced reporting (point-to-point reporting of specific alarm conditions) DACT shall be mounted integral to or beside fire alarm control panel.

2.14 FIRE ALARM CABLING

1. All fire alarm cabling shall:
   a. Have red outer insulation/jacket with ripcord.
   b. Be listed and labeled for the intended use in Fire Alarm systems.
   c. Where Level 2 or Level 3 pathway survivability is required by NFPA 72, cabling shall be 2-hour fire rated circuit integrity (CI) type.
   d. Be manufactured by West Penn, Allied, Belden or Superior Essex.

2.15 FIRE ALARM SYSTEM MANUFACTURER

A. All equipment shall be listed by UL. All panels and peripheral devices shall be the standard equipment of a single manufacturer and shall display the manufacturer's name on each component. Manufacturer's numbers specified in this section are those of Simplex Time Recorder Company to denote type, quality, material and desired operating features to be furnished.

B. Equipment shall be as manufactured by Simplex, Notifier or EST.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations.

B. The contractor shall provide 120VAC power to all remote booster power supplies, control panels, transponder cabinets or other similar items as required. Where the project is provided with emergency power from an emergency generator, all power supplies shall be connected to an emergency source. Dedicated branch circuit(s) shall be provided to supply primary power to the fire alarm system. The associated branch circuit breakers shall be furnished with lock-on hardware and shall be identified with red marking as a fire alarm circuit. The location of the circuit disconnecting means shall be permanently identified at the fire alarm control unit.

C. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 Parts I and III, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 Parts I and II.

D. All wiring shall be installed in strict compliance with pathway survivability requirements of applicable codes including NFPA 72.

E. Upon completion, the contractor shall so certify in writing to the owner and general contractor.

F. Front surface of all junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be sprayed red and labeled "Fire Alarm" or “F/A”. Covers in exposed areas shall be labeled “F/A” on interior of front cover. Wiring color code shall be maintained throughout the installation.

G. All fire alarm wiring shall be installed in conduit. Conduit shall be sized per manufacturer’s recommendations, but in no case shall conduit be smaller than 3/4”.

H. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

I. All raceways shall be concealed unless specifically shown or approved otherwise.

J. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

K. Install System Record Document cabinet adjacent to control panel unless alternate location is approved.

L. The manufacturer's authorized representative shall provide on-site supervision of installation and shall provide all system setup and programming services.

M. The manufacturer’s authorized representative shall have as a minimum, a NICET LEVEL III certification. The fire alarm contractor shall have a technician with a minimum Nicet Level III certification working in a position of responsibility. All technicians working for the certified contractor shall have a minimum Nicet Level II certification. Any fire alarm contractor wishing to bid on the fire alarm work shall show evidence of certifications at the pre-bid conference.

N. The fire alarm contractor shall be licensed as a certified fire alarm contractor by the state in

which the work is to be performed in compliance with all requirements of state fire marshall or other AHJ's as applicable.

O. The drawing/specifications included herein are to indicate contract intent only. The Fire Alarm contractor shall provide final design documents to include plans specifying exact device types/locations, circuitry, battery calculations, circuit/voltage drop calculations, etc. in accordance with all applicable code requirements. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the Fire Alarm contractor, and must bear the engineer's licensure seal with signature and date.

3.2 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor, and shall submit final testing results with O&M documentation..

B. The contractor shall test and demonstrate proper operation of all smoke detection equipment and associated HVAC controls to the satisfaction of the authority-having-jurisdiction and fire marshal.

3.3 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

3.4 CERTIFICATION & ACCEPTANCE

A. A factory trained representative of the manufacturer shall supervise final testing of the system in accordance with N.F.P.A. Standard 72H-1984 in the presence of a representative of the authority having jurisdiction. Manufacturer's representative shall be NICET trained and shall have a level III NICET certificate. It shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.

B. The fire alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

C. The equipment manufacturer shall be represented by a local service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall be located within 50 miles of the job site. The service organization shall furnish, gratis to the Owner, a one year maintenance warranty contract, effective from the date of final acceptance.

END OF SECTION 28 31 00

SECTION 28 78 00

EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

PART 1 - GENERAL

1.1 INITIAL RADIO SIGNAL SURVEY (INCLUDE IN BASE BID)

A. Include all costs in base bid for the Fire Alarm Contractor to conduct a radio signal survey immediately after building structure is complete, and prior to ceiling installation to determine signal coverage and strength of the municipality's emergency responder radio (public safety) system inside the project facility.

B. Conduct a survey using a RF Spectrum Analyzer, a calibrated, system-compatible radio or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength. Both inbound and outbound signal strength shall be determined, measured, calculated and documented as required by code and AHJ. Survey shall be performed by FCC GROL certified technicians. Survey shall include measurements at a minimum of 20 readings per floor or 1,600SF if the floor area exceeds 32,000SF and in all critical areas or as otherwise directed by AHJ.

C. Survey report and drawing indicating measurements at each frequency band of interest shall be submitted to the AHJ for review. The report shall clearly indicate all areas that do not meet a minimum of -95dBm nominal uplink or downlink signal at 100% or a Delivered Audio Quality (DAQ) of 3.0.

D. If measured levels determined to be insufficient, a complete Emergency Responder Radio Coverage (ERRC) system shall be provided in accordance with these specifications below. Cost for the system and installation will be paid through allowance.

E. Contractor shall be responsible for scheduling survey so that all of the following is completed prior to the installation of ceilings:
1. Conduct initial survey
2. Submit survey results and report to the AHJ for review and determination of system requirements
3. Provide system design and submit shop drawings to architect and AHJ for review

1.2 SCOPE (SEE ALLOWANCES)

A. The contractor shall design, furnish, install, and warranty a complete Emergency Responder Radio Coverage (ERRC) system. The installed system shall include all hardware, bi-directional amplifiers, band-pass filters, surge suppressors, lightning protection, UPS, transmission lines, power cabling, antennas, and other components necessary for a complete operational system as specified and as acceptable to the local authorities having jurisdiction.

B. Equipment manufacturer name and model numbers specified are provided to establish quality of equipment and system operational features. Any proposed substitution of equipment from that specified must be approved by the Architect within ten (10) days prior to bid date.

C. The entire system shall be guaranteed for a period of one (1) year from the date of final

acceptance of the installation and the Contractor shall repair or replace defective equipment, during this period, at no cost to the owner.

D. Entire system shall be verified and approved by local AHJ to comply with all emergency responder radio network requirements including signal strength and frequency range.

1.3 DEFINITIONS

A. BDA: Bi-Directional Amplifier is a two-way signal booster that is used to amplify band-selective or multi-band RF signals in the uplink, to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.

B. DAS: Distributed Antenna System is a network of separate antenna nodes connected to a common transport medium.

C. ERRC: Emergency Responder Radio Coverage System is a complete in-building radio communication system that brings wireless signals into a structure from outside, amplifies those signals with a signal booster (BDA), and then evenly distributes the amplified signals throughout a structure via a Distributed Antenna System (DAS). The system also amplifies signals originating inside the building and transmits them outside.

D. Donor Antenna: Antenna that receives and transmits signal to radio system outside of facility.

1.4 STANDARDS

A. The system shall comply with all requirements of the latest edition of each of the following codes and standards. The latest edition of these codes and standards form a part of this specification:
1. U.L. Standard 2524.
2. International Fire Code Section 510
3. NFPA 1221
4. NFPA 72
5. All requirements of local Fire Department, Building Department and all other authorities having jurisdiction (AHJ)

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For headend and distribution system. Include plans, elevations, sections, details and attachments to other work.
1. Show fabrication and installation details for equipment.
2. Functional Block Diagram: Show single-line interconnections between components for headend and distribution system. Show cable types and sizes.
3. Dimensioned Plan and Elevations of Headend Equipment: Show access and workspace requirements.
4. Wiring Diagrams: For power, signal, and control wiring and transmission cable, include cross connects, taps, and other connections cords.

C. Design Calculations: Calculate signal attenuation budget and show calculated line and equipment losses for the system based on the functional block diagram, to show that proposed

system layout can be expected to perform up to specification. Calculate signal strength from sources to endpoints. Allowable losses between components and user interface shall be used to determine size and type of cable.

D. Coordination Drawings: Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements.

E. Equipment List: Include each piece of equipment and include model number, manufacturer, serial number, location, and date of original installation. Insert testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.

F. Field quality-control reports.

G. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals.

H. Contract shall submit set of all drawings and product data to permitting agencies as required. These final design documents shall be prepared under the supervision of an engineer licensed in the state where the work is to be performed, engaged/employed by the system vendor, and must bear the engineer's licensure seal with signature and date.

I. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included.

J.

PART 2 - PRODUCTS

2.1 RADIO FREQUENCY (RF) BDA-BASED SIGNAL BOOSTER SYSTEMS

A. In-building signal booster systems shall receive and re-transmit the entire uplink/downlink frequency band utilized by the regional emergency service provider(s)**.** The contractor shall confirm with the regional emergency service provider(s) as to the specific frequencies used by the various agencies. This system shall be state-of-the-art, operating bi-directionally and in full duplex. The system shall be fully compatible with and function on Locality's Public Safety Radio System.

B. BDA shall be capable of providing in building coverage for all the cellular networks as identified by the owner.

C. Signal boosters (BDA)
1. Shall have Nema Type 4 enclosure
2. Shall be UL2524 listed
3. Shall be FCC certification.
4. Provide standby battery system capable of maintaining the system operational for a minimum of 12 hours or 2 hours if supplied by emergency generator circuit. Batteries system shall be completely enclosed in Nema Type 4 enclosure.
5. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit

shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed

6. Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building).
7. Include relays as required for monitoring system with fire alarm system.

D. DAS Antennas shall be architectural, dome or flush type where located in public areas. Stick type antennas are acceptable where located in back-of-house spaces. Finish shall be white unless directed otherwise by architect in submittal review.

E. A dedicated supervised monitoring panel shall be provided next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

1. Normal AC power
2. Signal booster trouble
3. Antenna Failure
4. Loss of normal AC power
5. Failure of battery charger
6. Low battery capacity

F. Completed installations (including cabling) shall comply with all applicable codes and standards, including County Building and Electrical Codes, NFPA, ANSI, NEC, OSHA, EIA, IEEE, R-56, etc., as well as the FCC Rules and Regulations, as applicable. Equipment provided shall be UL listed and FCC type accepted for this specific application. Compliance to codes and standards shall extend to include proper grounding, bonding and surge.

G. All cabling shall be plenum rated.

2.2 DESIGN REQUIREMENTS:

A. The system shall provide digital signal strength coverage over 95% area on each floor/level of the equipped building, or in specific areas defined by Locality in a Scope of Work document for a particular building or site. Critical areas shall have 99% floor area coverage.

B. Systems shall provide a minimum digital and analog overage of Circuit Merit (CM) 3 and Delivered Audio Quality (DAQ) 3.0, with a reliability factor of 95%.

C. Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions

D. A Coverage Acceptance Test shall be executed prior to final acceptance of an installed system. Coverage acceptance testing shall be based on audio quality performance in evenly spaced test grids in the defined service areas. A minimum of 20 tests will be taken per floor/level. Total number of test grids will be determined by the Owner, based on the size of the space per floor/level.

E. Design and appearance will be of “finished” construction, i.e. shall be concealed and/or unobtrusive in finished areas. DAS antennas shall be located in back-of-house areas where possible. If required to be located in visible public aeras, antennas shall be architectural, low-

profile type and located in corridors where possible. Unless indicated otherwise, wire mold and surface conduit installations will not be acceptable unless approved in writing by the Architect in advance.

2.3 MANUFACTURER

A. Equipment shall be as manufactured by Simplex, Notifier or EST or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring shall be in strict accordance with the National Electrical Code and all state and local regulations. Wiring shall be installed in accordance with manufacturer's wiring diagrams and shall test free from ground, opens and short circuits.

B. All connections shall be made under the direct supervision of a qualified technician.

C. Contractor shall provide dedicated power circuits as required for system operation. Where an emergency distribution system is provided, radio coverage system power shall be connected to the emergency branch.

D. All vertical riser cabling shall be installed in conduit within a 2-hour fire rated enclosure.

E. All copper circuits routed between or outside of buildings shall be provided with a surge protection device at each end.

F. Securely mount donor antenna on roof and aim towards direction of public safety city repeater antenna. All mounting and penetrations shall be coordinated with roofing contractor.

G. Contractor shall provide all devices and cabling as required to monitor system with building Fire Alarm System in accordance with all applicable code requirements.

H. Refer to Specification Section 27 05 00 for additional installation requirements.

I. During initial installation, each system shall be optimized to perform in accordance with the specifications set forth in the system design, manufacturer's specifications and FCC regulations. The contractor shall ensure that uplink and downlink levels are properly set and consistent with design expectations. The contractor shall further ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications and FCC regulations. Prior to system acceptance, for each active BDA, booster amplifier, etc., the contractor shall submit a Proof of Performance certification, that lists the design expectations, actual measurements, and if applicable, FCC specifications for the following parameters:
   1. Worst case BDA uplink input level, in dBm.
   2. Worst case BDA uplink output level, in dBm.
   3. BDA downlink input level, in dBm.
   4. BDA downlink output level, in dBm.
   5. Noise and spurious products, BDA uplink output, in dBc.
   6. Noise and spurious products, BDA downlink output, in dBc.

J. The original Proof of Performance report shall be submitted to Owner's project manager, and a copy of the Proof of Performance report shall be affixed to its associated equipment.

3.2 WARRANTY

A. The contractor shall provide a full one-year warranty to cover installation and all equipment, software, and components; the warranty shall commence upon the Owner's final acceptance of the facility. Under warranty coverage, the successful contractor shall provide same business day response time for system malfunctions.

B. The contractor shall perform optimization of each system during the initial warranty period, sixty (60) to ninety (90) days prior to warranty expiration. This optimization task is separate from the initial optimization performed during system installation. The contractor shall include pricing for annual system optimization to be included as part of post-warranty maintenance. Actual scope of work for annual optimization and maintenance will vary on a case-by-case basis, but typically will consist of the following:
   1. Optimize the system to perform in accordance with the specifications set forth in the system design, manufacturer's specifications and FCC regulations.
   2. Ensure that uplink and downlink levels are properly set and are consistent with design specifications.
   3. Ensure that noise and spurious products are held within limits set forth in the system design, manufacturer's specifications and FCC regulations.

C. Update the Proof of Performance records for the system, listing the design expectations, actual measurements, and if applicable, FCC specifications for the following parameters:
   1. Worst case BDA uplink input level, in dBm.
   2. Worst case BDA uplink output level, in dBm.
   3. BDA downlink input level, in dBm.
   4. BDA downlink output level, in dBm.
   5. Noise and spurious products, BDA uplink output, in dBc.
   6. Noise and spurious products, BDA downlink output, in dBc.

D. The updated Proof of Performance report shall be submitted to the Owner, and a copy of the updated Proof of Performance report shall be affixed to its associated equipment.

E. Visually inspect outside antenna installation. Correct any issues found with the antenna mounting hardware, grounding system, or outside cabling.

F. Visually inspect inside BDA or booster amplifier equipment installation. Correct any issues found with RF cabling, electrical connection, or equipment mounting.

G. Clean equipment fans, filters and other ventilation system components.

H. Inspect and replace any defective indicator lights.

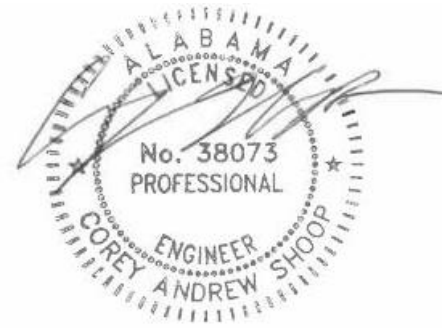
I. Test battery system performance for proper fallback to battery power and the duration of battery operation.

J. Test fault reporting system for proper operation and reporting of system faults.

K. Submit a written Preventive Maintenance Report to the Owner, listing the results of the optimization and preventive maintenance effort. The report shall include the Proof of Performance report for active RF components, and details of any other discrepancies found and corrective actions taken.

L. All as-built drawings shall be submitted to the Owner at completion, which shall include antenna system layout and all associated hardware, along with specification sheets. Include RF measurements taken.

END OF SECTION 28 78 00



05/28/2024

Applicable for Sections: 31 1000, 31 2000, 31 2500, 32 1216, 32 1313, 32 1613, 32 1723, 33 1000, 33 3000 and 33 4001

SECTION 31 1000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes Sections:
.. Section 31 2000 - "Earth Moving"
.. Section 02 4100 - "Demolition"

1.2 SUMMARY

A. This Section includes the following:

1. Protection of existing trees and landscaping to remain, if any, and boundary and property line markers, bench marks, survey control points, and existing structures and improvements which are to remain.

2. Environmental and erosion control measures, as indicated and as otherwise required by applicable codes, regulations, and authorities having jurisdiction.

3. Removal of trees and other vegetation, as indicated, and within "controlled areas."

4. Topsoil stripping, and stockpiling, as indicated, and within "controlled areas."

5. Removing above-grade improvements as indicated, and as required to accommodate new construction.

6. Removing below-grade improvements as indicated, and as required to accommodate new construction.

1.3 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction, unless specifically indicated elsewhere in contract documents.

B. Protection of Existing Improvements:

1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place. Clearing, demolition and any excavation within 5'-0" of existing buildings and structures to remain shall be performed by hand.

2. Protect improvements on adjoining properties and on Owner's property.

3. Protect boundary and property line markers, bench marks, and survey control points.

4. Restore damaged improvements and markers to their original condition, as acceptable to property owners.

PART 2 - PRODUCTS

A. Not applicable to this Section.

PART 3 - EXECUTION

3.1 SITE CLEARING

A. General:

1. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated.

B. Topsoil:

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

   a. Remove heavy growths of grass from areas before stripping.

3. Stockpile topsoil in storage piles in areas as indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, as required, to prevent wind erosion, or seed and mulch if left undisturbed for a period of time greater than 14 consecutive days.

4. Legally dispose of off-site unsuitable soil, excess topsoil not to be stockpiled, and waste material debris.

5. Fill depressions caused by site clearing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

   a. Place fill material in horizontal layers not exceeding 8 inches loose depth, and thoroughly compact to a density equal to adjacent original ground, unless specific compaction is otherwise indicated in Section 31 2000 “Earth Moving”, or, as directed in the geotechnical investigation.

3.2 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner’s Property: Burning will not be permitted on Owner’s property.

B. Removal from Owner's Property: Remove waste materials, trash and debris, and legally dispose of same off site.

END OF SITE CLEARING

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 26 - "Electrical"

1.2 SUMMARY

A. This Section includes unclassified excavation, grading and fill as follows:

1. Preparing of subgrade for building slabs, walks, and pavements; and additional work indicated on the Drawings and in the Project Manual.

   a. Comply with recommendations in the Owner's "Report of Geotechnical Exploration", this Section, and other Division 31 Sections; Refer also to Civil and Structural Drawings for additional information and requirements.

   b. Undercutting of building area as indicated in the Report of Geotechnical Investigation and in the Contract Documents.

   c. Perform excavation by hand within 5'-0" of existing buildings and structures to remain. Design and provide all necessary supports, shoring, etc., as required to prevent settlement, collapse, and/or other damage to existing buildings and structures to remain.

      1) DO NOT EXCAVATE BELOW THE EFFECTIVE BEARING AREA OF FOUNDATIONS OF EXISTING BUILDINGS AND STRUCTURES. In the event of conflict during construction, notify Architect prior to proceeding with work in the effected area.

   d. Compaction of backfill at any basement and below grade walls shall only be by hand-directed compaction equipment. Heavy construction equipment and/or heavy trucks shall not be allowed within 10-feet of any basement walls, and within 5-feet of foundation walls.

2. Drainage fill course (porous fill) for support of building slabs is included as part of this work; compacted in place.

3. Excavating and backfilling of trenches within building control areas and on site.

4. Stripping and stockpiling of topsoil (if any) is specified in Section 31 1000 - Site Clearing.

5. The extent of earthwork is indicated on the Drawings. This earthwork is to be included in the base bid as unclassified excavation, regardless of material encountered.

6. Removal of existing improvements may also be specified under various Division 31 Sections.

B. Excavating and Backfilling for Electrical Work: Refer to Divisions 26 section for excavation and backfill required in conjunction with underground electrical utilities and buried electrical appurtenances, not work of this Section.

1. However, construction materials and execution for 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 Division 26.

C. Placement and compaction of at least 4-inches of topsoil up to finish grades is included in the work of this Section.

1. Allow for thickness of topsoil and sod.

1.3 DEFINITIONS

A. "Excavation" consists of removal of materials and existing improvements encountered to subgrade elevations indicated, and subsequent disposal of materials removed.

B. "Unauthorized" excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Geotechnical Engineer. Unauthorized excavation, as well as remedial work directed by Owner's Geotechnical Engineer, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Owner's Geotechnical Engineer.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner's Geotechnical Engineer.

C. "Additional Excavation": When excavation has reached required subgrade elevations, notify Owner's Geotechnical Engineer, who will make an inspection of conditions. If Owner's Geotechnical Engineer determines that bearing materials at required subgrade elevations are unsuitable, continued excavation may be required. If additional excavation is required, replace excavated material as directed by Owner's Geotechnical Engineer.

1. The Contract Sum will be adjusted by Change Order, or as provided in General Conditions, for additional excavation, measured in place (Bank Measure), and its replacement appropriately authorized in writing prior to beginning the work, and for which the Contractor is due payment from the Owner.

D. "Subgrade": The undisturbed earth or the compacted soil layer immediately below pavement base course, select drainage fill, bottom of indicated undercut areas, or topsoil materials.

E. "Structure": Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

F. "Building Control Area" and/or "Controlled Area": Below and at least 10-feet beyond building foot print or exterior walls, and below roofs, to include covered porches and canopies, and below and at least 5-feet beyond all walks and pavements subject to bearing vehicular traffic.

G. "Mud Footings" (if any): The at least 2-inches to 4-inches of lean 2,500 psi (minimum) concrete placed in the bottom of footing and foundation trenches and excavations, which is required if permanent or structural concrete cannot be placed the same day they are excavated.

1. Unless mud footings are indicated on Structural Drawings, their depth shall be compensated for by over-excavation.

2. Mud footings (if any) shall be completely clean prior to placement of any reinforcing and/or permanent or structural concrete.

3. Refer to the Owner's "Geotechnical Investigation" Report, and Structural Drawings for additional information and requirements for other "mud footings" (or "mud mats", or "mud seals").

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

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, prior to any excavation work. This organization will contact its member utility companies to locate and mark all of their own underground facilities.

a. Notify non-member companies directly, for them to perform this service.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions and record locations on as-built record drawings. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

a. Provide minimum of 48-hour notice to Owner and copy Architect, and receive written notice to proceed before interrupting any utility.

4. Demolish and completely remove from the site any existing underground utilities to be removed, and all existing underground utilities in "controlled areas". Coordinate with utility companies for shutoff of services if lines are active.

C. Use of Explosives: **Use of explosives *is not* permitted.**

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Comply with requirements of current regulations of OSHA, applicable Codes, ordinances, and authorities having jurisdiction.

4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

5. Perform excavation by hand within 5'-0" of existing buildings and structures to remain, and within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap. Paint root cuts of 1-inch and larger with emulsified asphalt tree paint.

   a. Do not under-mine or excavate below footings and/or foundations which are to remain.

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 (Grassed areas only; Cuts and fills outside "controlled areas", during general grading): Satisfactory soil materials from on-site excavations, free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious material.

1. All fill soils must be compatible with existing soils, so they can bond together.

E. Topsoil: Refer to Section 31 1000 - "Site Clearing."

F. Rock Fill: Refer to Owner's "Report of Geotechnical Investigation" for recommendations regarding placement and compaction requirements.

PART 3 - EXECUTION

3.1 PROOFROLLING

A. Areas throughout significant slopes and beneath and 10'-0" beyond new building and covered areas, and beneath and 5'-0" beyond new pavement areas (back-of-curb or other paving edge termination) shall be designated as "controlled areas." Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a loaded tandem axle dump truck or similar approved equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the "controlled areas". If any areas fail the proofroll, repair these areas as directed by the Owner's Geotechnical Engineer.

1. Proofrolling shall be conducted in the presence of testing lab's Geotechnical Engineer.

2. Do not proofroll when the ground surface is wet or saturated with water.

3.2 EXCAVATION

A. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as structures, foundations, rock or unauthorized excavation.

B. Perform excavation by hand within 5'-0" of existing buildings and structures to remain.

1. Do not under-mine or excavate below footings and/or foundations which are to remain.

C. Refer to "Definitions" paragraph above for any "mud footings" required.

3.3 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.4 DEWATERING

A. Prevent surface water and Geotechnical or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Contractor to provide and maintain, at their expense, pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3. Due to the types of soil that exist on site, seepage and/or springs may occur. If excessive seepage or springs are discovered, notify Owner's Geotechnical Engineer and Architect immediately.

3.5 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill only within the limits of the area under construction. No stockpiling will be allowed in areas that are not under construction. If there is not room for stockpiling, then the contractor will be responsible for legally disposing of the material and will not get additional compensation for the replacement of that material if fill is needed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations.

2. Dispose of excess excavated soil material by removal and legal disposal off-site.

3.6 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus, a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3. If any additional undercut is required, the contractor shall be paid by unit price through an allowance according to Section 01 2100 “Allowances”. The undercut will be replaced with acceptable structural fill properly compacted. All excess undercut will be disposed of off-site at the contractor’s expense.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

1. If any additional undercut is required, the contractor shall be paid by unit price through an allowance according to Section 01 2100 “Allowances”. The undercut will be replaced with acceptable structural fill and properly compacted. All excess undercut will be disposed of off-site at the contractor’s expense.

3.8 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.

3.9 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.10 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under all areas, use satisfactory excavated or borrow material. Refer to Owner’s “Report of Geotechnical Exploration”, and this Section, for minimum testing requirements.

2. Under building slabs, use drainage fill material of compacted and finished depth indicated, or if not indicated, **at least 4-inches** compacted and completed thickness.

3. Backfill trenches with concrete where trench excavations pass within 18-inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

a. Concrete is specified in Division 3.

b. Do not backfill trenches until inspections and any required testing have been made and backfilling is authorized by Architect based on test results. Use care in backfilling to avoid damage or displacement of pipe systems.

c. Utility trenches shall be backfilled with acceptable borrow or dense graded aggregate in 6" loose lifts compacted with mechanical piston tampers to the project requirements. Open graded stone is not to be used as backfill.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, etc.

2. Inspections, testing, approval, and recording locations of underground utilities have been performed and recorded.

3. Removal of concrete formwork, if any.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.

a. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

5. Removal of trash and debris from excavation.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls, where necessary.

3.11 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 back-of-curb or edge of paving, where occurs), remove loose soils as described in this and replace with suitable material that is compacted to 98% standard proctor.

d. Under lawn or unpaved areas beyond "controlled areas", compact each layer of backfill or fill material in accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".

e. On-site Borrow (where allowed): In accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".

f. Select and/or Structural Fill: In accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".

g. Porous Fill (drainage course): In accordance with the recommendations made in the Owner's "Report of Geotechnical Investigation".

2. Moisture Control:

a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to 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.

3.12 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.

3.13 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.

3.14 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.

3.15 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

3.16 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.

3.17 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 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.

3. 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 ™, or approved equal for inlet protection.

G. High Density Poly-Ethylene (HDPE) Filters or Silt-Saver™, or approved equal for inlet protection.

H. A stabilized construction entrance shall be constructed temporarily.

I. Riprap for slopes, culvert, storm drain inlet, and outlet aprons.

J. Water for dust control.

K. Wattle check dams shall be spaced according to plans.

L. Erosion control blankets and/or turf reinforcement mats to protect seed and prevent erosion on slopes.

PART 3 – EXECUTION

3.1 PREPARATION

A. Review site erosion and sediment control plan attached to this section of the specifications.

B. Deficiencies or changes in the erosion control plan as it is applied to current conditions will be brought to the attention of the Engineer for remedial action.

3.2 IMPLEMENTATION

A. Provide catalog cuts and information concerning the erosion control products which will be used for construction for review by the Engineer.

B. Provide information concerning the installation of the erosion and sedimentation control including anchorage trench provisions and anchorage devices and spacing for review by the Engineer.

C. Provide construction exit pad in accordance with the erosion and sediment control plan and in accordance with the approved installation procedures.

D. Place erosion control systems in accordance with the erosion and sediment control plan and in accordance with approved installation procedures.

E. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations. The Owner has the authority to direct the Contractor to provide immediate permanent or temporary pollution control measures. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical.

F. The temporary erosion control systems installed by the Contractor shall be maintained as directed by the Engineer to control siltation at all times during the life of the Contract. The Contractor must respond to any maintenance or additional work ordered by the Engineer within a 48 hour period.

G. Slopes that erode easily shall be temporarily seeded as the work progresses according to the ALDOT seeding schedule or according to the seeding schedule contained in the plans.

H. Remove and properly dispose of accumulated silt and sediment from all erosion control measures on a daily basis off site unless material is reusable.

I. Remove and properly dispose of all trash and sediments accumulated in existing and new storm drainage inlets, structures, and pipes on a daily basis off site unless material is reusable.

J. Provide temporary diversion berms and ditches as required during construction to protect work areas from up-slope runoff and/or to divert sediment-laden water to appropriate sediment control devices, traps, or stabilized outlets.

K. Provide water trucks or other adequate method for controlling dust throughout the construction period.

END OF EROSION & SEDIMENTATION CONTROL

SECTION 31 3116
TERMITE CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:
   1. Section 03 3100 - Concrete.
   2. Section 31 2000 - Earth Moving.

1.03 DESCRIPTION OF WORK

A. Work described in this section includes soil treatment for termite control, for use and application below any new on-grade interior floor slabs, and also where any existing slabs may be opened or removed for any new, repair, replacement, or other subgrade work at interior of building and/or within interior perimeter exterior walls.

1.04 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2019.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
   1. Include the EPA-Registered Label for termiticide products

C. Manufacturer's Instructions: Indicate caution requirement.

D. Qualification Data: For Installer of termite control products.

E. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Brand name and manufacturer of termiticide.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes, and rates of application used.
   6. Areas of application.
   7. Water source for application.

F. Submit completed forms for required warranties, guarantees, and bonds for acceptance, prior to beginning work.

G. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Having minimum of three (3) years documented experience.
   2. Licensed in accordance with regulations of governing authorities for application of soil treatment solution in the State in which the Project is located.

B. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

C. Source Limitations: Obtain termite control products through one source and from a single manufacturer for each product.

D. Use only termiticides which bear a Federal registration number of the U.S. Environmental Protection Agency.
   1. Formulate and apply termiticides according to the EPA-Registered Label.

E. Mix treatment solution on site, in presence of Contractor's Superintendent, using clean potable water and new termiticide delivered to site in undamaged, original, unopened, and factory-sealed containers.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements for application, application licensing, and authority to use toxicant chemicals, and comply with EPA regulations.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants where required.

1.08 SEQUENCING

A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

1.09 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

B. Environmental Limitations: To insure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Provide paid-up and bonded guarantee for a period of five (5) years from date of treatment, signed by the Applicator and Contractor. Paid-up guarantee shall include annual inspection during the five (5) years and an agreement to renew the bond annually after the five (5) years is up, on payment by the Owner of an annual fee.
   2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.
   3. A specimen of the form of guarantee and the bond shall be submitted for approval before the work begins.

C. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.

D. Wood Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied wood termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite damage is discovered during warranty period, repair or replace damage caused by termite infestation and treat replacement wood.
   1. Warranty Period: 12 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

B. Manufacturers/Products: Subject to compliance with requirements, provide one of the following termiticide products:
   1. Aventis Environmental Science USA LP; Product "Termidor".
   2. Bayer Environmental Science Corp; Product "Premise 75, Premise Pre-Construction, or Premise Pro": www.nobugs.com.
   3. Nisus; Product "Bora-Care": www.nisuscorp.com.
   4. Syngenta Professional Products: www.syngentaprofessionalproducts.com.

C. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

D. Diluent: Recommended by toxicant manufacturer.
   1. Fuel oil will not be permitted as a dilutent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

C. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
   1. Proceed with application only after unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.03 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.
   1. Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

C. Spray apply toxicant in accordance with manufacturer's instructions.

D. Apply toxicant at following locations:
   1. Under Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment.
      a. Under slab-on-grade structures, treat soil before concrete footings and slabs are placed, using the following rates of application (unless manufacturer recommends otherwise):
         1) Apply four (4) gallons of chemical solution per ten (10) linear feet to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.
         2) Apply one (1) gallon of chemical solution per ten (10) square feet as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.
         3) Apply four (4) gallons of chemical solution per ten (10) linear feet of trench, for each foot of depth from grade to footing, along outside edge of building. Dig a trench six (6) inches to eight (8) inches wide along outside of foundation to a depth of not less than twelve (12) inches.

Punch holes to top of footing on not more than twelve (12) inches on center and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench

2. In Crawl Spaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
    a. In crawl-space and basement structures, treat soil along exterior and interior walls of foundations with shallow footings as specified above for exterior of slab-on-grade structures. Treat soil under or around crawl-space structures using the following rates of application (unless manufacturer recommends otherwise):
        1) Apply four (4) gallons of chemical solution per ten (10) linear feet of trench along inside of foundation walls, along both sides of interior partitions, and around piers and plumbing. Do not apply an overall treatment in crawl spaces.
        2) Apply four (4) gallons of chemical solution per ten (10) linear feet of trench, for each foot of depth from grade to footing, along outside of foundation walls.
        3) Apply one (1) gallon per ten (10) square feet of soil surface as an overall treatment, where attached concrete structures are on fill or ground.
3. Foundations: At Both Sides of Foundation Surface: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
4. At hollow masonry foundations or grade beams:
    a. Treat voids at rate of two (2) gallons per ten (10) linear feet (unless manufacturer recommends otherwise), poured directly into the hollow spaces.
5. Masonry: Treat voids.
6. At expansion joints, control joints, and areas where slabs will be penetrated:
    a. Apply at rate of four (4) gallons per ten (10) linear feet of penetration (unless manufacturer recommends otherwise).
7. Soil Within 10 feet of Building Perimeter For a Depth of 1 foot .

E. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

F. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

G. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

H. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

I. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

J. Re-treat disturbed treated soil with same toxicant as original treatment.
    1. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

K. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

L. Post signs in areas of application warning workers that soil termiticide treatment has been applied. Remove signs when areas are covered by other construction.

3.04 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 32 1216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Related work described elsewhere includes:

.. Section 31 2000 - "Earth Moving"
.. Section 32 1313 - "Concrete Paving"
.. Section 32 1613 - "Curbs and Gutters"

1.2 DESCRIPTION OF WORK

A. Work described in this section includes new bituminous paving, a new base, and otherwise as indicated on drawings.

B. Work shall also include pavement patching for any utility trenches under existing paving and this Contract, with prepared subgrade, 8" crushed aggregate base, 6 inch thick 3,000 psi concrete, prime coat, and 1-1/2 inches bituminous concrete overlay, and as indicated on the Drawings.

1. Pavement patch shall extend 9" to 1'-0" beyond each side or edge of trench, and to abut flush with edge where existing paving was cut out.

1.3 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of bituminous materials and other manufactured items, certifying that these products comply with specifications and standards listed hereinafter.

1. All asphalt used for pavement shall be produced by a plant certified by the Alabama Department of Transportation (ALDOT).

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the "Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction", latest edition.

C. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by an independent testing laboratory. Refer to Section 01 0150 - "Special Conditions," for additional information.

1.4 JOB CONDITIONS

A. Any base or sub-base areas damaged by weather or construction operations shall be scarified, remixed and recompacted in accordance with requirements before application of the prime coat.

B. Special care and attention shall be given to be certain that paving operations and/or equipment do not cause damage to any existing and/or new buildings, structures, or improvements which are to remain.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide the paving system(s) indicated on the Drawings, installed in accordance with Part 3 of this Section, and referenced standards.

PART 3 - EXECUTION

3.1 PRIME COAT

A. Application rates and construction requirements shall be as specified in ALDOT Section 401, Bituminous Surface Treatments, for a Bituminous Treatment Type "A" which is a prime coat.

3.2 TACK COAT

A. Construction requirements, including preparation of the existing surface or substrate and maximum application rates, are specified in ALDOT Article 405.03.

3.3 PLANT MIX BITUMINOUS CONCRETE BINDER LAYER AND BITUMINOUS CONCRETE WEARING SURFACE

A. Construction requirements, including finished surface tolerance, density requirements, and maintenance and protection shall be as specified in ALDOT Articles 410.03 through 410.07, 327.03 and 424.04, as applicable. Rate of application shall be not less than the number of pounds per square yard for a 1-inch wearing surface or pavement patching layer, pro-rated for other thicknesses, as required by referenced ALDOT Specifications.

3.4 CRUSHED AGGREGATE BASE

A. Construction requirements shall comply with the ALDOT Specifications for the materials indicated, including in part, applicable portions of Section 825, Type B and ALDOT Section 301; compacted in accordance with the recommendations made in the geotechnical investigation.

3.5 COMPACTION EQUIPMENT

A. Compaction equipment shall be self-propelled, capable of compacting the mixture throughout the depth of the layer while it is still in a workable condition without damage to the material.

1. Self-propelled rollers shall have a minimum weight of 10 tons.

3.6 PAVEMENT PATCH

A. Saw cut perimeter of existing paving to a neat straight line where removal is indicated and/or required.

1. Protect edges of paving and base exposed to prevent cracking, breaking-up, wash-out, erosion, and/or other damage; apply prime coat as specified and at all such vertical edges prior to placing new pavement.

B. Patch pavement with components stated in Paragraph 1.2-B above, in compliance with each component's specified requirements, and as per details and sections on Drawings, if any.

END OF HOT-MIXED ASPHALT PAVING

SECTION 32 1313

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

.. Section 31 2000 - "Earth Moving"
.. Section 03 3100 - "Concrete"
.. Section 07 9000 - "Joint Sealers"

1.2 DESCRIPTION OF WORK:

A. Extent of portland cement concrete paving is shown on drawings, including exterior walks, paving, entry pads, dumpster pads, and mechanical equipment pads.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with "Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction," latest edition, and local governing regulations if more stringent than herein specified.

B. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by a qualified independent testing laboratory. Refer to Section 01 0150 - "Special Conditions", for additional information and requirements.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Forms:

1. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

2. Use flexible spring steel forms or laminated boards to form radius bends as required.

3. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh:

1. Welded plain cold-drawn steel wire fabric, ASTM A 185.
   a. Size: 6" x 6" #6, unless indicated otherwise.

2. Furnish in flat sheets, not rolls, unless otherwise acceptable to Engineer, for all concrete paving subject to possibility of bearing the weight of vehicular traffic.

3. Furnish in rolls for all concrete paving accessible only to pedestrian traffic, unless indicated otherwise on structural drawings.

4. Locations for Use: All concrete pads and paving, at 1/3 of total depth of concrete from top of slab.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40 or 60.

D. Concrete Materials: Comply with requirements of Section 03 3100 - "Concrete", for concrete materials, admixtures, bonding materials, and other materials as required.

E. Expansion Joint Materials: Comply with requirements of Section 07 9000 - "Joint Sealers" for preformed and pourable expansion joint fillers and sealers.

F. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

2.2 CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of Section 03 3100 - "Concrete", for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:

1. Sidewalks, curbs and gutters, entry pads, and mechanical equipment pads subject only to pedestrian traffic:

   a. Compressive Strength: 3,000 psi, minimum at 28 days.
   b. Maximum Slump: 2"
   c. Air Content: 4% to 6%
   d. Thickness: 6", unless indicated otherwise.
   e. Compacted Subgrade: 6" 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 550 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% to 6%
   d. Thickness: 8", 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-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints:

1. Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows below.

2. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

3. Sidewalks shall be scored at 5-foot intervals unless otherwise indicated.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

D. Expansion Joints:

1. Provide expansion joints with premolded joint filler at locations abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

2. Extend joint fillers full-width and depth of joint.

3. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

4. Expansion joints for sidewalks shall be placed at 30-foot maximum intervals and along all intersections with other walks, steps, curbs, or other vertical surfaces.

E. Fillers and Sealants: Comply with the requirements of Section 07 9000 - “Joint Sealers”, for preparation of joints, materials, installation and performance.

3.6 CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Using hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs and formed joints with an edging tool, and round to 1/4" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Light and smooth broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation as required to provide a fine line texture acceptable to Architect.

E. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

F. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

1. Provide rubbed finish for exposed edges of concrete work, and apply light and smooth broom finish.

3.7 CURING:

A. Protect and cure finished concrete paving, complying with applicable requirements of Section 03 3100 - "Concrete". Use curing and sealing compound or approved moist-curing methods.

B. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

3.8 REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy resign grout.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF CONCRETE PAVING

SECTION 32 1500
AGGREGATE SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Crushed stone surfacing.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of subbase.

B. Section 32 1123 - Aggregate Base Courses.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone Surfacing: Pit run, washed, 3/8 inch (1 cm) stone; free of shale, clay, friable material, and debris.

B. Aggregate Base Course: See Section 32 1123.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subgrade has been prepared correctly, is smooth, and is at proper grade and level.

B. Do not begin work until subgrade is correct.

3.02 INSTALLATION

A. Place aggregate base course, see Section 32 1123.

B. Place surfacing or aggregate-turf pavement in maximum 4 inch (100 mm) layers.
   1. Roller compact to specified density.

END OF SECTION

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SECTION 32 1613

CURBS AND GUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

B. Related work specified elsewhere includes:

.. Section 31 2000 - "Earth Moving"
.. Section 32 1313 - "Concrete Paving"
.. Section 03 3100 - "Concrete"
.. Section 07 9000 - "Joint Sealers"

1.2 DESCRIPTION OF WORK

A. Work described in this section includes the construction of new concrete curbs and gutters, and/or straight curbs where indicated, and patching between any existing paving and new curb and gutters, sidewalks, etc., to match existing pavement.

B. Refer to Drawings and Owner's Report of Geotechnical Exploration, for additional information and base requirements.

C. Refer to Section 31 2000 - "Earth Moving" for subgrade requirements below and beyond curbs and gutters.

D. Refer to Section 32 1313 - "Concrete Paving", for valley gutters, turn-outs, and paving.

1.3 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of ready-mix concrete, reinforcing steel, curing material, joint fillers, and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, latest edition.

C. Testing: All laboratory and field testing as required to ensure compliance with these specifications shall be performed by a qualified independent testing laboratory. Refer to Section 01 0150 - "Special Conditions", for additional information.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete shall be Class "A", Type 4 (3,000 psi), in accordance with Section 501, "Structural Portland Cement Concrete", of the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, latest edition. A modified mix shall be used if optional machine laid curb and gutter is constructed.

B. Reinforcing steel, where called for on the drawings, shall meet the requirements of Section 502, "Steel Reinforcement".

C. Curing material shall be either burlap cloth, waterproof paper, polyethylene sheeting, or impervious membrane specified in ALDOT Articles 830.01 and 830.02.

D. Joint filler and sealer for expansion and construction joints shall meet the appropriate requirements of ALDOT Section 832, and Section 07900 - "Joint Sealers" herein.

E. Asphalt for repairs shall comply with referenced ALDOT Specifications, and city requirements, and shall match existing pavement at location(s) requiring patching.

PART 3 - EXECUTION

3.1 CURBS AND GUTTERS

A. Comply with requirements of Section 32 1313 - "Concrete Paving," Section 03 3100 - "Concrete," and the following:

1. Construction requirements, including foundation, forms, sections, joints, placing and finishing concrete, curing and protection, and backfilling shall be as specified in Article 623.03. Curbs and gutters shall match the profile of existing adjoining curb and gutter, if any, and otherwise as detailed.

2. Curb and gutter shall be constructed in sections having a maximum length of 10-feet. Transverse expansion joints with filler and joint sealer shall be installed at all curb returns and in curb and gutter at intervals not exceeding 40-feet. Similar joints shall be installed behind the curb where sidewalks adjoin the curb and gutter, and at all fixed objects which adjoin or extend through the curb and gutter.

3. Care shall be exercised that "tilt-out" curb and gutter is installed where pavement slopes away from the curb, and that 10-foot long transition sections are used where required to transition between "standard" and "tilt-out" curb and gutter.

3.2 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14-days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF CONCRETE CURBS AND GUTTERS

SECTION 32 1723

PAVEMENT MARKING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work described in this section includes marking of graphic symbols, lane separations, parking stripes, and lettering on concrete and asphalt pavements, if any, at locations indicated and as shown on the Drawings.

B. Related work specified elsewhere includes:
.. Section 32 1216 - "Asphalt Paving"
.. Section 32 1313 - "Concrete Paving"

1.2 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of materials, certifying that these products comply with specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, most current edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint for pavement marking shall be, traffic marking paint complying with Section 856, of the ALDOT specifications, and as follows:

1. Class 1, Type A (reflective) in public Right-of-Ways.
2. Class 1, Type B (non-reflective) within property lines of this project's site, 2 coats.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING:

A. Each individual painted parking stripe shall be 4-inches wide, and shall be laid out as indicated on the drawings. Construction requirements shall conform to the applicable parts of Article 701.03 of the ALDOT Specifications for Class 1, Type as specified, traffic stripe.

1. Color shall be white for asphalt, yellow for concrete pavement, and international blue for striping and graphics for parking spaces for people with disabilities.
2. Use same materials and construction methods for any arrows and symbols indicated on paved areas.
3. Mark paving at each space for the people with disabilities with acceptable international graphics symbol, unless otherwise indicated, approximately 4' x 4' in size. Locate centered in space width and approximately 2'-0" from end of space where vehicle enters.

END OF PAVEMENT MARKING

SECTION 32 9219
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Hydroseeding, mulching and fertilizer.

1.02 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

2.02 SEED MIXTURE

A. Seed Mixture:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. Place topsoil in accordance with Section 31 2200.

C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 30 lbs per 1000 sq ft evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

END OF SECTION

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SECTION 32 9223
SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Fertilizing.

C. Sod installation.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of subsoil in preparation for work of this section.

1.03 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.05 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Alabama.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

2.02 MATERIALS

A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.

E. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

F. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

G. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding ____ lbs.

END OF SECTION

SECTION 32 9300
PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Topsoil bedding.

C. New trees, plants, and ground cover.

D. Mulch and Fertilizer.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Topsoil material.

B. Section 31 2323 - Fill: Topsoil material.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

B. Weeds: Any plant life not specified or scheduled.

C. Plants: Living trees, plants, and ground cover specified in this Section , and described in ANSI Z60.1.

1.04 REFERENCE STANDARDS

A. ANSI/AHIA Z60.1 - American National Standard for Nursery Stock; 2014.

1.05 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.

B. Maintenance Services: Performed by installer.

C. Non-native, Invasive Plant Species: Do not introduce, grow, or cultivate plant species that are non-native to the ecosystem of the project site, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

1. Comply with laws regulating non-native and invasive plant species in the State in which the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Protect and maintain plant life until planted.

C. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.07 FIELD CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

B. Do not install plant life when wind velocity exceeds 30 mph.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year warranty.

C. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

D. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Plant Materials: Certified by federal department of agriculture; free of disease or hazardous insects.

2.02 PLANTS

A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work.

2.03 MULCH MATERIALS

2.04 TOP SOIL MIX

A. A uniform mixture of 1 part peat and 3 parts topsoil by volume.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil and planters are ready to receive work.

B. Saturate soil with water to test drainage.

C. Verify that required underground utilities are available, in proper location, and ready for use.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 3 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds 6 inches larger than plant root system.

3.03 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be planted. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches.

END OF SECTION

SECTION 33 1000

WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 31 2000 - "Earth Moving"
2. Division 22 – Plumbing

1.2 SUMMARY:

A. This Section includes water service piping system, meter, vaults, valves, and appurtenances from the existing on-site utility source of potable water to a point 5 feet outside the building, and as indicated on the Drawings, and in this Section of the Project Manual.

B. Note that the Contractor shall furnish and install connection, water meter, etc., acceptable to the utility company and call on the utility company to approve the meter and inspect the installation prior to covering.

C. All fees and charges for water service, meters, taps, permits, impact fees, etc., if any, shall be paid by the Contractor from their contract amount.

D. The extent of water service piping system, fire hydrants, etc., is indicated on the Drawings, in this Section, other referenced Sections of the Project Manual, and as otherwise required by authorities having jurisdiction.

1. All water pipe which run under roads, streets, driveways, and other vehicular paving shall be sleeved in AWWA C151 ductile iron sleeves.

E. Utility Compliance: Comply with Authority Having Jurisdiction regulations and standards pertaining to sanitary sewerage systems.

1. Where conflicts or discrepancies occur with the plans or these specifications, Authority Having Jurisdiction regulations and standards shall govern.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections

1. Product data for water service piping and fire protection pipe and specialties.
2. Shop drawings for water vaults, including lids.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS - GENERAL:

A. General: Pipe, valves, fittings and installation in R.O.W. and on site shall comply with requirements of this Section, other referenced Sections of the Project Manual, the Drawings, and the Authority Having Jurisdiction.

1. Pipe, fittings, hydrants and valves shall be as specified herein, subject to acceptance by the Authority Having Jurisdiction, unless other specific materials acceptable to the Authority Having Jurisdiction are indicated on the Drawings.

2. PVC piping and fittings smaller than 4" shall be C900 PVC, Class 200 plastic pipe, Schedule 40, or Type K Copper; and pipe 4" and larger, below paving and fire lines shall be ductile iron, of type(s) acceptable to the Authority Having Jurisdiction, unless other specific materials acceptable to the Authority Having Jurisdiction are indicated on the Drawings.

B. PVC Plastic, Schedule 40 PVC with pressure-rated fittings: Conform to ASTM D 1785 standard specifications for PVC plastic pipe.

C. PVC Plastic, Water Pipe: AWWA C900, Class 200. Include elastomeric seal according to ASTM F477.

1. Ductile Iron Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type, and specifically designed for joining PVC pipe; Include elastomeric seals according to ASTM F 477 or as otherwise required for joining plastic pipe specified

2. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended in writing by piping system manufacturer, unless otherwise indicated.

D. Where copper pipe is indicated, provide Soft Copper Tube, ASTM B 88, Type K, water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

E. Ductile-Iron, Push-on-Joint Pipe: AWWA C151 and ANSI C150, C151, A21.50, and A21.15 respectively, Class 350 as approved by the Authority Having Jurisdiction, tar coated outside, with cement lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

1. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111 (ANSI 21.11) and according to ASTM D-3139.

2. Joining Materials: AWWA C111 rubber gaskets and lubricant according to ASTM F477 requirements.

F. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

1. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

2. Joining Materials: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.

G. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

H. Pipe Sleeves: Provide pipe sleeves at least one size larger than water service piping required below existing concrete and paving, and as follows.

1. Below Concrete, Entry Pads, and Paving Subject to Only Pedestrian Traffic, and for Future Irrigation: Schedule 40 PVC.

2. Below Concrete, Equipment Pads, Dumpster Pads, Valley Gutters, Curbs and Gutters, Paving Subject to Vehicular Traffic, and Where Indicated: Ductile Iron, as specified above herein this Section.

I. Identification for Underground Plastic Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allen Systems, Inc.; Reef Industries, Inc.
b. Brady (W.H.) Co.; Signmark Div.
c. Calpico, Inc.
d. Carlton Industries, Inc.
e. EMED Co., Inc.
f. Seton Name Plate Co.

2. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in blue letters "CAUTION - WATER LINE BURIED BELOW."

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Comply with requirements of Division 22, the International Plumbing Code, Drawings, the Authority Having Jurisdiction and requirements of other authorities having jurisdiction.

B. Comply with requirements of the State Health Department, the local Health Department, and authorities having jurisdiction.

3.2 DEPTH OF COVER:

A. Provide minimum cover of 30-inches for all water bearing piping.

3.3 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.4 CLEANING:

A. Clean and disinfect water distribution piping as follows, or as required by utility company, Code, and authorities having jurisdiction:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.

2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:

a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.

b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.

c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.

d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

B. Prepare reports for all purging and disinfecting activities, and submit for review and along with each set of “Record Documents”.

END OF WATER SERVICE PIPING

SECTION 33 3000

SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 31 2000 - "Earth Moving"
2. Section 03 3100 - "Concrete"
3. Division 22 - "Plumbing"

1.2 SUMMARY:

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

B. The extent of sanitary sewerage system is indicated on the Drawings, in this Section 33 3000, and as otherwise required by authorities having jurisdiction.

C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the Contractor from their contract amount.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for drainage piping and specialties.
2. Test Reports.

1.4 QUALITY ASSURANCE:

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.

B. Utility Compliance: Comply with Authority Having Jurisdiction regulations and standards pertaining to sanitary sewerage systems.

1. Where conflicts or discrepancies occur with the plans or these specifications, the Authority Having Jurisdiction regulations and standards shall govern.

C. Health Department Compliance: Comply with the State Department of Health Code or the local Health Department code, regulations and standards, whichever is more stringent.

D. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

1.5 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate any connection to public sewer with the Authority Having Jurisdiction.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cleanouts:
   a. Ancon, Inc.
   b. Josam Co.
   c. Smith (Jay R.) Mfg. Co.
   d. Wade Div.; Tyler Pipe.
   e. Zurn Industries, Inc.; Hydromechanics Div.

2. Underground Warning Tapes:
   a. Allen Systems, Inc.; Reef Industries, Inc.
   b. Brady (W.H.) Co.; Signmark Div.
   c. Calpico, Inc.
   d. Carlton Industries, Inc.
   e. EMED Co., Inc.
   f. Seton Name Plate Co.

2.2 PIPE AND FITTINGS:

A. Ductile-Iron, Gravity Sewer Pipe and Fittings:

1. Pipe: Ductile iron pipe meeting AWWA C-150, C-151 and ANSI A21-50 and A 21.15 for coated outside and cement lined inside. Cement lining according to AWWA C104, Class 350.
2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
3. Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets: AWWA C111, rubber.

B. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

C. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in red letters "CAUTION - SANITARY SEWER LINE BURIED BELOW."

2.3 CLEANOUTS:

A. General: Provide Mission adjustable repair coupling (or approved equal) with stainless steel bends and stainless-steel shear ring and a Zurn #ZN1400HD-3, Smith 4220 (or approved equal) cover set flush in a minimum 14" square concrete slab.

2.4 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill according to provisions in Section 31 2000 – Earth Moving.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS:

A. Refer to Paragraph 2.2 above.

3.3 INSTALLATION, GENERAL:

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use fittings for changes in direction. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 1 percent, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION:

A. Join and install ductile iron pipe per ALDOT Standard Specifications.

3.5 CLEANOUTS:

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout lid in concrete block 14 by 14 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.6 TAP CONNECTIONS:

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.

B. When tapping into existing man holes, use flexible rubber boot in accordance with authority having jurisdiction's requirements.

C. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

D. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

1. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.7 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.8 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

END OF SANITARY SEWERAGE

SECTION 33 4001

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

.. Section 31 2000 - "Earthmoving"
.. Section 03 3000 - "Cast-In-Place Concrete"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes the construction of new storm drainage pipe and structures as shown on the Drawings

1.3 QUALITY CONTROL:

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of pipe, gaskets, reinforcing steel, cast iron downspout boots, cast iron frames, covers and grates, ready-mix concrete and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2014 Edition or most current edition.

C. Testing: All laboratory and field testing as required to ensure compliance with these specifications will be performed by an independent testing laboratory.

D. Comply with requirements of the International Plumbing Code, the American Concrete Pipe Association, and authorities having jurisdiction, when more stringent than specified or otherwise indicated

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Where indicated, pipe smaller than 12-inches in diameter shall be Schedule 80 PVC, Contech A2000 PVC (or approved equal), or ADS N-12 HP HDPE, unless otherwise indicated on the drawings.

1. Where indicated on the Drawings for "french drain" or "perforated underdrain", pipe shall be equivalent to ADS N-12 (perforated) corrugated HDPE pipe with smooth interior or

perforated Contech A2000 PVC, complete with filter fabric "sock" and all required or necessary system accessories, fittings, and components, as specified in Article 853.13.

B. Pipe larger than 12-inches (or equivalent area in arch pipe) shall be Class 3, minimum reinforced concrete pipe (RCP) as specified in Article 850, or as indicated on the Drawings.

C. Concrete and reinforcing steel for headwalls, inlets, manholes, and other storm drainage structures shall comply with Alabama Department of Transportation Specification Section 501, and Section 502. Concrete shall be Class "A", Type 2 (3,000 psi).

D. Masonry materials and precast concrete units shall conform to Article 621.02.

E. Castings for frames, covers and grates in drainage structures shall comply with ALDOT Section 836, with particular attention directed to ALDOT Article 836.04, 836.05, 836.06, and 836.07.

1. All manhole covers shall be round.

F. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in black letters "CAUTION – STORM SEWER LINE BURIED BELOW."

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allen Systems, Inc.; Reef Industries, Inc.
b. Brady (W.H.) Co.; Signmark Div.
c. Calpico, Inc.
d. Carlton Industries, Inc.
e. EMED Co., Inc.
f. Seton Name Plate Co.

PART 3 - EXECUTION

3.1 STORM DRAIN PIPE:

A. Construction requirements, including excavation of trench, placing pipe, and backfilling around pipe shall conform to the applicable portions of Article 530.03 of the Alabama Department of Transportation specifications.

B. Bedding for storm pipe shall be as shown on the Drawings and as per the pipe manufacturer's requirements, Type 3 or better installation. Open graded stone, such as #57 stone, is not allowed as backfill.

C. Compaction requirements for backfill shall be the same as specified for type of surface constructed over the trench, paved or planted areas as described in Section 31 2000 - "Earthmoving."

D. Properly coordinate with elevations of grades, footings, other below grade work, and etc.

3.2 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.3 STRUCTURES:

A. Inlets, manholes, cleanouts and other storm drainage structures shall be installed or constructed in accordance with applicable portions of the following sections of the Alabama Highway Department Standard Specifications:

1. Section 501 - Structural Portland Cement Concrete.
2. Section 502 - Steel Reinforcement.
3. Section 613 - Brick and Concrete Block Masonry.
4. Section 620 - Minor Structure Concrete.
5. Section 621 - Inlets, Junction Boxes, Manholes and Miscellaneous Drainage Structures.
6. Section 622 - Resetting Gratings and Covers and for Catch Basins, Inlets, and Manholes.

END OF STORM DRAINAGE