CONSTRUCTION DOCUMENTS

PROJECT MANUAL &
SPECIFICATIONS

For

Bradford Exempted Village School District

760 Railroad Avenue
Bradford, OH 45308

Bradford EVSD New Athletic Facility

JULY 6, 2026
LPA PROJECT NUMBER: 263401.00

Project Address:

760 Railroad Avenue
Bradford, Ohio 45308

Prepared by:

LEVIN PORTER
ARCHITECTS
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MIAMISBURG, OHIO 45342
Levin Porter Associates Inc. dba Levin Porter Architects

DIVISION 21 FIRE SUPPRESSION

21 0000 General Requirements for Fire Suppression Systems

21 0001 Basic Fire Suppression Requirements
21 0005 Excavation, Backfill and Surface Restoration

21 0500 Common Work Results for Fire Suppression

21 0519 Meters and Gauges
21 0529 Pipe Hangers and Supports
21 0530 Equipment Bases and Supports
21 0553 Identification for Fire Suppression Systems

21 1000 Water Based Fire Suppression Systems

21 1100 Facility Water Service
21 1313 Wet-Pipe Sprinkler Systems

DIVISION 22 PLUMBING

22 0000 General Requirements for Plumbing Systems

22 0001 Basic Plumbing Requirements
22 0005 Excavation, Backfill and Surface Restoration

22 0500 Common Work Results for Plumbing

22 0513 Electrical Requirements for Plumbing Equipment
22 0519 Meters and Gauges
22 0523 General Duty Valves
22 0529 Pipe Hangers, Supports, and Penetrations
22 0553 Identification for Plumbing Systems

22 0700 Plumbing Insulation

22 0719 Pipe Insulation

22 1000 Plumbing Piping and Pumps

22 1116 Domestic Water Piping
22 1119 Domestic Water Piping Specialties
22 1316 Sanitary Waste and Vent Piping
22 1319 Sanitary Waste Piping Specialties
22 1613 – Natural Gas House Piping

22 3000 Plumbing Equipment

22 3416 Instantaneous, Tankless Gas Domestic Water Heaters

224000 Plumbing Fixtures

22 4200 Plumbing Fixtures

DIVISION 23 HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

23 0000 General Requirements for HVAC Systems

23 0001 Basic HVAC Requirements

23 0500 Common Work Results for HVAC

23 0513 Electrical Requirements for HVAC Equipment
23 0530 Equipment Bases and Supports
23 0548 Vibration Control
23 0553 Identification for HVAC Systems
23 0593 Testing, Adjusting and Balancing

23 0700 HVAC Insulation

23 0713 Duct Insulation

23 3000 HVAC Air Distribution

23 3113 Ductwork
23 3300 Air Duct Accessories
23 3400 Fans
23 3713 Diffusers, Registers, Grilles, And Louvers

23 7000 Central HVAC Equipment

23 7413 Packaged, Outdoor, Air Handling Units

23 8000 Decentralized HVAC Equipment

23 8126 Variable Refrigerant Volume Heat Recovery Systems

DIVISION 26 ELECTRICAL

26 0000 General Requirements for Electrical Systems

26 0001 Basic Electrical Requirements
26 0002 Electrical Work in Existing Buildings
26 0003 Sleeve Installation for Electrical Penetrations
26 0004 Firestopping for Electrical Systems
26 0005 Excavation, Backfill and Surface Restoration

26 0500 Common Work Results for Electrical

26 0519 Low-Voltage Electrical Power Conductors and Cables
26 0523 Control-Voltage Electrical Power Cables
26 0526 Grounding and Bonding for Electrical Systems
26 0529 Hangers and Supports for Electrical Systems
26 0533 Raceway and Boxes for Electrical Systems
26 0537 J-Hook Pathways For Electrical Systems
26 0543 Pullboxes, Underground Ducts and Raceways for Electrical Systems
26 0553 Identification for Electrical Systems
26 0563 Specific Wiring Applications

26 0900 Instrumentation and Control for Electrical

26 0923 Lighting Control Devices

26 2000 Low-Voltage Electrical Distribution

26 2213 Low-Voltage Distribution Transformers
26 2416 Panelboards
26 2726 Wiring Devices
26 2813 Fuses
26 2816 Enclosed Switches and Circuit Breakers
26 2913 Enclosed Motor Controllers

26 4000 Electrical Cathodic Protection

26 4313 Surge Protective Devices (SPD) for Low-Voltage Electrical Power Circuits

26 5000 Lighting

26 5113 Interior Lighting Fixtures

26 6000 Electronic Safety and Security

26 6102 Fire Detection and Alarm System

26 7000 Communications

26 7533 Raceway and Boxes for Communications Systems

SECTION 000001
TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

A. 000001 – Table of Contents
B. 000002 – Legal Notice
C. 000003 - Instructions to Bidders
D. 000004 - Bid Form
E. 000005 – Contractor Qualifications Statement
F. 000006 – Bid Guaranty and Bid Bond
G. 000007 – Delinquent Personal Property Taxes
H. 000008 – Non-Collusion Affidavit
I. 000009 – Owner Contractor Agreement
J. 000010 – General Conditions

SPECIFICATIONS

2.01 DIVISION 01 -- GENERAL REQUIREMENTS

A. 010090 – Revit and CAD Release
B. 011000 - Summary
C. 012300 - Alternates
D. 012500 - Substitution Procedures
E. 012500.01 – Substitution Request Form
F. 013000 - Administrative Requirements
G. 013100 – Progress Schedule
H. 013400 – Shop Drawings
I. 015100 - Temporary Facilities and Controls
J. 016000 - Product Requirements
K. 016100 – Transportation and Handling
L. 016200 – Storage and Protection
M. 017000 - Execution and Closeout Requirements
N. 017800 - Closeout Submittals
O. 017900 - Demonstration and Training

2.02 DIVISION 02 -- EXISTING CONDITIONS

A. 023001 – Soils Report

2.03 DIVISION 03 -- CONCRETE

A. 033000 – Cast-In-Place Concrete

2.04 DIVISION 04 -- MASONRY
A. 042200 – Concrete Unit Masonry
B. 047200 – Cast Stone Masonry

2.05 DIVISION 05 -- METALS
A. 055100 - Metal Stairs
B. 055213 - Pipe and Tube Railings

2.06 DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES
A. 061000 - Rough Carpentry
B. 062000 - Finish Carpentry
C. 064100 - Architectural Wood Casework

2.07 DIVISION 07 -- THERMAL AND MOISTURE PROTECTION
A. 072100 - Thermal Insulation
B. 072113 – Pre-Engineered Metal Building Insulation System
C. 072500 – Weather Barriers
D. 074213 – Metal Wall Panels
E. 076200 - Sheet Metal Flashing and Trim
F. 077200 - Roof Accessories
G. 079200 - Joint Sealants

2.08 DIVISION 08 -- OPENINGS
A. 081113 - Hollow Metal Doors and Frames
B. 083313 - Coiling Counter Doors
C. 084313 - Aluminum-Framed Storefronts
D. 085113 – Aluminum Windows
E. 087100 - Finish Hardware
F. 088000 - Glazing

2.09 DIVISION 09 -- FINISHES
A. 092116 - Gypsum Board Assemblies
B. 092216 - Non-Structural Metal Framing
C. 095100 - Acoustical Ceilings
D. 096500 - Resilient Flooring
E. 096566 - Resilient Athletic Flooring
F. 096813 – Tile Carpeting
G. 099113 - Exterior Painting
H. 099123 - Interior Painting

2.10 DIVISION 10 -- SPECIALTIES
A. 101423.16 – Roof Identification Panel Signage

B. 102113.19 - Plastic Toilet Compartments
C. 102800 - Toilet, Bath, and Laundry Accessories
D. 104400 - Fire Protection Specialties

2.11 DIVISION 11 -- EQUIPMENT
A. 116623 – Gymnasium Equipment

2.12 DIVISION 12 -- FURNISHINGS
A. 123600 – Countertops

2.13 DIVISION 13 -- SPECIAL CONSTRUCTION
A. 134919 – Metal Building Systems

2.14 DIVISION 14 -- CONVEYING EQUIPMENT
A. NA

2.15 DIVISION 21 -- FIRE SUPPRESSION
A. 21 0001 Basic Fire Suppression Requirements
B. 21 0005 Excavation, Backfill and Surface Restoration
C. 21 0519 Meters and Gauges
D. 21 0529 Pipe Hangers and Supports
E. 21 0530 Equipment Bases and Supports
F. 21 0553 Identification for Fire Suppression Systems
G. 21 1100 Facility Water Service
H. 21 1313 Wet-Pipe Sprinkler Systems

2.16 DIVISION 22 – PLUMBING
A. 22 0001 Basic Plumbing Requirements
B. 22 0004 Firestopping for Plumbing Systems
C. 22 0005 Excavation, Backfill and Surface Restoration
D. 22 0513 Electrical Requirements for Plumbing Equipment
E. 22 0519 Meters and Gauges
F. 22 0523 General Duty Valves
G. 22 0529 Pipe Hangers, Supports, and Penetrations
H. 22 0553 Identification for Plumbing Systems
I. 22 0719 Pipe Insulation
J. 22 1116 Domestic Water Piping
K. 22 1119 Domestic Water Piping Specialties
L. 22 1316 Sanitary Waste and Vent Piping
M. 22 1319 Sanitary Waste Piping Specialties
N. 22 1613 – Natural Gas House Piping

O. 22 3416 Instantaneous, Tankless Gas Domestic Water Heaters
P. 22 4200 Plumbing Fixtures

2.17 DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
A. 230001 - Basic HVAC Requirements
B. 230513 - Electrical Requirements for HVAC Equipment
C. 230530 - Equipment Bases and Supports
D. 230548 - Vibration Control
E. 230553 - Identification for HVAC Systems
F. 230593 - Testing, Adjusting and Balancing
G. 230713 - Duct Insulation
H. 232300 – Refrigerant Piping
I. 233113 - Ductwork
J. 233300 - Air Duct Accessories
K. 233400 - Fans
L. 233713 - Diffusers, Registers, Grilles, And Louvers
M. 237413 - Packaged, Outdoor, Air Handling Units
N. 238126 - Variable Refrigerant Volume Heat Recovery Systems

2.18 DIVISION 25 -- INTEGRATED AUTOMATION
A. NA

2.19 DIVISION 26 – ELECTRICAL
A. 260001 - Basic Electrical Requirements
B. 260002 - Electrical Work in Existing Buildings
C. 260003 - Sleeve Installation for Electrical Penetrations
D. 260004 - Firestopping for Electrical Systems
E. 260005 - Excavation, Backfill and Surface Restoration
F. 260519 - Low-Voltage Electrical Power Conductors and Cables
G. 260523 - Control-Voltage Electrical Power Cables
H. 260526 - Grounding and Bonding for Electrical Systems
I. 260529 - Hangers and Supports for Electrical Systems
J. 260533 - Raceway and Boxes for Electrical Systems
K. 260537 - J-Hook Pathways For Electrical Systems
L. 260543 - Pullboxes, Underground Ducts and Raceways for Electrical Systems
M. 260553 - Identification for Electrical Systems
N. 260563 - Specific Wiring Applications
O. 260923 - Lighting Control Devices
P. 262213 - Low-Voltage Distribution Transformers
Q. 262416 - Panelboards
R. 262726 - Wiring Devices

S. 262813 - Fuses
T. 262816 - Enclosed Switches and Circuit Breakers
U. 262913 - Enclosed Motor Controllers
V. 264313 - Surge Protective Devices (SPD) for Low-Voltage Electrical Power Circuits
W. 265113 - Interior Lighting Fixtures
X. 266102 - Fire Detection and Alarm System
Y. 267533 - Raceway and Boxes for Communications Systems

2.20 DIVISION 27 -- COMMUNICATIONS
A. NA

2.21 DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY
A. NA

2.22 DIVISION 31 – EARTHWORK
A. NA

2.23 DIVISION 32 -- EXTERIOR IMPROVEMENTS
A. 323113 - Chain Link Fences and Gates

2.24 DIVISION 33 – UTILITIES
A. NA

END OF TABLE OF CONTENTS

LEGAL NOTICE

INVITATION TO BID

BRADFORD EXEMPTED VILLAGE SCHOOLS
NEW ATHLETIC FACILTY
760 Railroad Avenue
Bradford, Ohio 45308

Separate sealed bids for furnishing all labor, materials, and equipment necessary for the construction of a new athletic facility as specified, will be received by the Office of the Treasurer, Bradford Exempted Village Schools on **August 5 at 2:00 P.M. (local time)** and will be opened and read aloud at that time at the above address.

Bids may be mailed or delivered in person to the Treasurer, Carla Surber, Bradford Exempted Village Schools, 760 Railroad Avenue, Bradford, Ohio 45308. Bids received after 2:00 P.M. (local time) will be returned unopened. No bids received through FAX or electronic transmission will be accepted.

Qualified Bidders may obtain digital sets of bidding documents after July 13, 2026 by contacting Mike Huff at mhuff@levin-porter.com. Documents will be distributed via electronic pdf file only (no fee).

A pre-bid conference will be held on July 22, 2026 at 10:00 A.M. at 760 Railroad Avenue, Bradford, Ohio 45308. The pre-bid conference is not mandatory but highly encouraged.

A bid security in the form of a Bid Bond in accordance with Chapter 153.54 of the Ohio Revised Code in the amount of 100 percent of the total bid shall accompany each bid, or a certified check, cashier's check, or letter of credit pursuant to Chapter 1305 of the Ohio Revised Code in the amount of 10 percent of the total bid shall accompany each bid.

The successful bidder(s) will be required to furnish a satisfactory performance bond for one hundred (100%) of the contract price.

No bidder may withdraw his bid within 60 days after the actual date of the bid opening.

The Board of Education reserves the right to reject each and every bid, and to waive informalities and errors in bidding to the extent permitted by law. This includes the right to extend the date and time for receipts of bids.

BOARD OF EDUCATION
Bradford Exempted Village Schools
By: Carla Surber, CPA, Treasurer

INSTRUCTIONS TO BIDDERS

A. EXAMINATION OF DOCUMENTS AND SITE CONDITIONS

1. **Bidders are strongly encouraged to visit the site to inspect the existing conditions and project requirements before submitting a bid.** Review carefully the site and all of the documents included in the Bid Package, including, but not limited to, Instructions to Bidders, Bid Form, Owner-Contractor Agreement, and specifications for the Work. For access to the site, contact the Director of Operations to make arrangements to visit the site at an acceptable time. These documents included in the Bid Package will become the Contract Documents, as defined in the Owner-Contractor Agreement, that govern the relationship between the successful Bidder and the Owner when the Owner-Contractor Agreement is executed and will be referred to as Contract Documents throughout these Instructions to Bidders.

2. **No allowance will be made subsequently for any omission, error or negligence of the Bidder**.

B. OWNER & DESIGN PROFESSIONAL

1. The Owner is: The Board of Education of the
Bradford Exempted Village Schools
760 Railroad Avenue, Bradford, OH 45308
Telephone: (937) 448-2770

Owner's Representative:
Skip Miller, Maintenance Supervisor
760 Railroad Avenue, Bradford, OH 45308
Telephone: (937) 448-2770
Cell phone: (937) 467-0020

2. The Design Professional Is:
Levin Porter Associates, Inc.
3011 Newmark Drive
Miamisburg, OH 45342
Telephone: (937) 224-1931

C. PROJECT

1. The Project consists of all labor, materials, and services necessary for the timely and proper completion of the **Bradford EVSD Athletic Facility**, as described in the Bid Package provided to Bidders. The Project is located at **760 Railroad Avenue, Bradford, OH 45308.**

2. The Project must be completed as follows:

Site available on August 31, 2026

Substantial Completion: June 1, 2027.

Final Completion: June 15, 2027.

D. WORK

The Project consists of a single contract to perform the specified work. The successful Bidder must use the State of Ohio Subcontract Form for subcontracted work, if applicable.

F. CONTRACT DOCUMENTS

The following documents are included in the Bid Package and are considered the Contract Documents:

1. Instructions to Bidders
2. Bid Form
3. Bid Guaranty and Contract Bond Form
4. Contract Bond Form
5. Contractor's Personal Property Tax Affidavit (R.C. § 5719.042)
6. Contractor Qualifications Statement
7. Owner-Contractor Agreement

Availability of Documents. The Bid Package for the Project will be provided electronically at no cost upon request to the Director of Operations.

G. PRE-BID MEETING

A pre-bid conference is schedule for July 22, 2026 at 10:00 A.M at 760 Railroad Avenue, Bradford, OH 45308. The pre-bid conference is not mandatory but highly encouraged.

Questions regarding the bid documents may be directed to Mike Huff at Levin Porter Architects: mhuff@levin-porter.com or 937-212-9191.

H. PREPARATION OF BIDS

1. Submit the bid on the Bid Form included in the Bid Package.
2. Complete the Bid Form, in ink or typewritten, in words and figures, and in figures only where no space is provided for words, and sign the Bid Form with the name typed or printed below the signature. Use the wording on the Bid Form without change, alteration or addition. Any change in the wording or omission of specified accompanying documents may cause the bid to be considered not responsive, in which case it will not be considered for award of a contract. In the case of a discrepancy between the numbers and words written, the words shall control.
3. Submit 1 completed Bid Form and a Bid Guaranty (refer to Section H(6)). Bids sent by fax or email will not be accepted. If the Bidder is a corporation, an officer authorized to bind the corporation to a contract must sign the Bid Form and include the legal name of the corporation followed by the name of the state of incorporation.
4. Enclose the bid submittal in a sealed opaque envelope, with the Bidder's name and title of the Project printed in the upper left hand corner, addressed as follows:

   Office of the Treasurer: Carla Surber
   Bradford Exempted Village Schools
   760 Railroad Avenue
   Bradford, OH 45308

   Instructions for delivery of bids and information on the bid opening are contained in Section H(9).
5. Take the following precautions in preparing a Bid:
   a. Sign the Bid Form and complete all blank spaces with requested information; include all requested documents with the bid submittal addressed as described in Section 4 above.

b. If the Bid Form requests bids for alternate items, indicate whether the amount named for an alternate item is an addition or deduction from the base bid amount. If no indication is included, the amount will be assumed to be an addition to the base bid amount.

c. If the Bid Form requests unit price information, provide the requested information.

d. If applicable, confirm that the Bid Guaranty is properly executed and signed by:

1) The Bidder
2) The Surety or Sureties

e. Confirm that the Bid Guaranty is for a specific sum in an amount as instructed in Section H(6)(a) below.

6. Bonds and Guarantees

a. Bid Guaranty: A Bid Guaranty must be included with the Bid Form, as prescribed in Ohio Revised Code Section 153.54, in the form of either: (1) a bond for the full amount of the bid (including all add alternates) (the form of Bid Guaranty and Contract Bond is included in the Bid Package); or (2) a certified check, cashier's check, or irrevocable letter of credit in an amount equal to 10% of the bid amount (including all add alternates).

b. Contract Bond: If the successful Bidder submits a certified check, cashier's check, or irrevocable letter of credit in an amount equal to 10% of the bid as its Bid Guaranty, it must provide the Owner with a Contract Bond in the form included in the Bid Package in an amount equal to 100% of the Contract Sum within 3 days of being notified that it is the apparent lowest responsible Bidder.

c. The bond must be issued by a surety company authorized by the Ohio Department of Insurance to transact business in the State of Ohio. The surety must be able to demonstrate a record of competent underwriting, efficient management, adequate reserves, and sound investments. These criteria will be deemed to be met if the surety currently has an A.M. Best Company Policyholders Rating of "A-" or better and has or exceeds the Best Financial Size Category of Class VII. For good cause shown, other sureties may be acceptable to the Owner, in its discretion.

d. All bonds must be signed by an authorized agent of an acceptable Surety and by the Bidder.

e. Surety bonds must be supported by credentials showing the power of attorney of the agent, and a certificate showing the legal right of the Surety to do business in the State of Ohio, and a financial statement of the Surety. These supporting documents may be submitted after the bid form and bid guaranty have been submitted to the Owner.

f. The Bid Guaranty, as applicable, must be in the name of or payable to the order of the Owner.

g. The name and address of the Surety and the name and address of the Surety Agent should be typed or printed on each bond, together with any other requested contact information.

7. Bidder's Examination and Representation.

a. Before submitting a bid, carefully examine the documents and the construction site and become familiar with limitations and conditions related to the Work covered by the bid and include in the bid a sum to cover the cost of such items. **The Bidder awarded the contract will not be given extra payments for conditions that could have been determined by examining the site and documents.**

b. It is the purpose and intent of the Contract Documents that a complete job be accomplished. Each Bidder is responsible to include costs necessary to provide labor and materials for that portion of the Work bid upon, including incidentals, whether or not specifically called for.

8. Clarification of Questions

a. Direct all questions about the Project to the Director of Operations.

b. The Bidder is responsible to call to the attention of the Director of Operations any ambiguities, inconsistencies, errors, or omissions that occur in the Contract Documents for its part of the Work. If a Bidder fails to request clarification, the Bidder will be expected to overcome such conditions without additions to the bid price.

c. Bidders with questions as to the true meaning of any part of the Contract Documents must submit a written request for interpretation and clarification to the Director of Operations, with a copy to the Design Professional, if any, **not later than the 7 days before the scheduled bid opening**.

d. Request interpretations if the Contract Documents call for materials, equipment, or methods that adversely affect the cost or quality of the Project or are unavailable.

9. Bid Opening. **Bids will be accepted until 2:00p.m. on August 5, 2026 at Bradford EVSD, 760 Railroad Avenue, Bradford, OH 45308** and will be opened publicly and read immediately at that time. The Bidder is responsible for ensuring that its bid submittal is received at the appropriate location prior to the deadline for receiving bids.

I. METHOD OF AWARD

1. Subject to the right of the Owner to reject any and all bids and as provided below, the Owner plans to award a single contract for the Project described in the Contract Documents. Bidders must furnish all information requested on the Bid Form and in the Bid Package. Failure to do so may result in disqualification of the bid.

2. Determination of Lowest Responsible Bid. Subject to the right of the Owner to reject any or all bids, the Owner will award the Contract for the Work to the Bidders submitting the lowest responsible bid, taking into consideration accepted alternates. The Owner, in its sole discretion, will determine whether a bid is responsive to the specifications or whether bidder is responsible. In determining whether a bid is responsive or a bidder is responsible, the Owner may consider the following criteria and such other criteria as it determines proper:

a. The Bidder's work history.

The Bidder should have a record of consistent customer satisfaction and of consistent completion of projects, including projects which are comparable to or larger and more complex than the Project, on time and in accordance with the respective contract documents. If the Bidder's management (*i.e.,* president, chairman of the board, or any director) operates or has operated another construction company, the Owner may consider the work history of that company in determining responsibility of the Bidder.

The Owner will consider the Bidder's prior experience on other projects of the Owner and/or the Design Professional, including the Bidder's demonstrated ability to complete its work on these projects in accordance with the Contract Documents and on time and its ability to work with the Owner and/or Design Professional, if any.

The Bidder authorizes the Owner and its representatives to contact the owners and design professionals on projects on which the Bidder has worked, and authorizes and requests such owners and design professionals to provide the Owner with a candid evaluation of the Bidder's performance. By submitting its bid, the Bidder agrees that if it or any person at its urging, directly or indirectly, brings an action against any of such owners or design professionals or their employees as a result of or related to such candidate evaluation and such action is not successful, the Bidder will reimburse such owners, design professionals and/or their employees for all legal fees and expenses incurred by them that are related to such legal action, including the cost of collection. This obligation is expressly intended for the benefit of such owners, design professionals and their employees.

b. The Bidder’s resources, including but not limited to the financial ability to complete the Contract successfully and on time without resort to its Surety and the experience, adequacy, and numbers of the Bidder’s work force.

c. The Bidder's compliance with federal, state, and local laws, rules, and regulations, including but not limited to the Occupational Safety and Health Act.

d. The foregoing information with respect to each of the Subcontractors the Bidder intends to use for the Project.

e. The Bidder’s participation in a drug-free workplace program through the Ohio Bureau of Workers Compensation or a program approved by the Bureau of Workers Compensation.

f Depending upon the type of the work, other essential factors, as the Owner may determine and as described in the specifications.

3. Within 3 business days after receipt of the bids, the apparent low Bidder, and any other bidder requested by the Director of Operations or the Design Professional, will complete and submit to the Director of Operations and the Design Professional the following documents:

   a. The list of all proposed Subcontractors, suppliers, and manufacturers.

   b. The breakdown of Labor and Material for the Project, including the sum for each, on AIA Document G702, Schedule of Values.

   c. Affidavit as to Property Taxes, in the form included with the Contract Documents.

   d. Contractor Qualifications Statement, if requested.

   e. After approval by the Owner of the list of proposed Subcontractors, suppliers, and manufacturers submitted by the successful Bidder, the list shall not be changed unless written approval of the change is authorized by the Owner.

4. Failure to submit requested information on a timely basis may result in the determination that the Bidder is not responsive, in which case the bid will not be considered for award of the contract.

5. By submitting a bid, the Bidder agrees that the Owner's determination of responsiveness and responsibility shall be final and conclusive, and that if the Bidder, or any person at the Bidder's urging, directly or indirectly challenges such determination in any legal proceeding and such challenge is not successful, the Bidder will reimburse the Owner for all legal fees and expenses incurred by the Owner that are related to such challenge, including the cost of collection.

6. No Bidder may withdraw its bid within 60 days after the date bids are opened.

7. The Owner reserves the right to disqualify bids, before or after opening, upon evidence of collusion with intent to defraud or other illegal practices on the part of the Bidder.

J. EXECUTION OF CONTRACT

1. Notice of Intent to Award Contract. The successful Bidder will be notified that it is the apparent low bidder for the work and provided with 2 copies of the Owner-Contractor Agreement (“Agreement”) in the form referenced in the Bid Package.

2. The successful Bidder must sign and return the original forms to the Owner, or as otherwise directed, for execution by the Owner. The contract will be effective as soon as it has been signed by the Owner, after approval by the Board of Education. The successful Bidder will be provided with a fully executed copy of the Agreement for its records. No property interest in the contract is created until the agreement is signed by the Owner.

3. If the successful Bidder does not return the executed contracts to the Owner within 5 business days of its receipt of the contracts from the Owner, the Owner reserves the right to determine the Bidder not responsive and award the contract to the next low responsible bidder.

K. SUBSTITUTIONS

1. Certain brands of material or apparatus are specified. Each bid must be based on these brands. The use of another brand may not be submitted as an alternate except as provided herein.
2. No substitution for a specified brand will be considered prior to receipt of bids, unless an addendum has been issued to all plan holders of record informing them of the change in specifications.

L. ALTERNATES

1. If the Owner requests bids on alternates, the Bidder should include the cost of the alternates requested on the Bid Form.
2. At the time of contract award, the Owner will select or reject alternates as it determines is in its best interest. A Bidder's failure to include the cost of an alternate selected by the Owner and applicable to the Bidder's work may render the bid non-responsive, in which case the bid will not be considered for award of the contract. Otherwise, the failure to include the cost of an alternate will not be deemed material.
3. If, during the progress of the Work, the Owner wishes to reinstate an alternate not included in the Contract, the Owner reserves the right to reinstate the alternate at the price stated on the Bid Form provided that such action is taken in sufficient time so as not to delay the progress of the work or cause the Bidder additional expense.

M. UNIT PRICES

1. If unit prices are requested on the Bid Form and unless otherwise expressly provided in the Bid Package, the unit price amount must include all labor, materials and services necessary for the timely and proper installation of the unit price item. Unit prices stated on the Bid Form will be the basis for any Change Orders entered into under the Owner-Contractor Agreement, unless the Owner determines that the unit price will cause substantial inequity to either the Contractor or the Owner.

N. ADDENDA

1. Any explanation, interpretation, correction or modification of the Bid Documents will be issued in writing in the form of an Addendum, which will be the only means considered binding; explanations, interpretations, etc., made by any other means shall NOT be legally binding. All Addenda will become a part of the Contract Documents. The Owner reserves the right to issue clarifications that do not change the specifications, which will not be considered addenda, if there is a need to change the bid date or issue a revised bid form or some other item that does not change the specifications for the Work.
2. Submit questions to the Design Professional, if any, in advance, to allow sufficient time for a response. All Addenda will be issued electronically to persons who have obtained the Bid Package for the Project, no later than 72 hours prior to the published time for the bid opening, excluding Saturdays, Sundays and legal holidays. If an Addendum is issued within 72 hours of the bid opening, then the time for the bid opening will be extended 1 week with no further advertising required. The clarifications described in the preceding section are not subject to the 72-hour limitation.
3. Copies of each Addendum or Clarification will be sent only to the Bidders that have received the Bid Package. Receipt of Addenda must be indicated by Bidders in the space provided on the Bid Form.
4. Each Bidder is responsible to carefully read and review the Bid Package and immediately bring to the attention of the Director of Operations and Design Professional, if any, any error, omission, inconsistency, or ambiguity therein.
5. If a Bidder fails to indicate receipt of all Addenda through the last Addenda issued by the Owner on its Bid Form, the bid of such Bidder will be deemed to be responsive only if:
    a. The bid received clearly indicates that the Bidder received the Addendum, such as when the Addendum added another item to be bid upon and the Bidder submitted a bid on that item; or

b. The Addendum involves only a matter of form or is one which has either no effect or has merely a trivial or negligible effect on price, quantity, quality, or delivery of the item bid upon.

O. STATE SALES AND USE TAXES

1. The Owner is a political subdivision of the State of Ohio. Building materials that the successful Bidder purchases for incorporation into the Project will be exempt from state sales and use taxes if the successful Bidder provides a properly completed sales tax exemption certificate, executed by the successful Bidder and the Owner, to the vendors or suppliers when the materials are acquired. The Owner will execute and provide a completed Ohio Sales Tax Exemption Certificate for Construction Contracts.

P. PROJECT SCHEDULE

1. Work on the Site must commence within a reasonable timeframe after award to ensure final completion on the dates indicated. The Project Site will be available as indicated above.
2. By submitting the Bid, the Bidder agrees that the periods for performing the Work are reasonable and that the Bidder's Work can be substantially complete not later dates as indicated above.
3. The Bidder further acknowledges the liquidated damages provisions included in the Owner-Contractor Agreement and agrees that these are reasonable for the scope and size of the Project.

Q. BID RESPONSIVENESS; OWNER'S RIGHT TO WAIVE DEFECTS AND IRREGULARITIES

1. The Bidder's bid must be responsive to the Invitation to Bid for the Project in all material respects and contain no material irregularities or deviations that would affect the amount of the bid or otherwise give the Bidder a competitive advantage.
2. The Owner reserves the right to waive any and all irregularities provided that the defects and irregularities do not affect the amount of the bid in any material respect or otherwise give the Bidder a competitive advantage.
3. By submitting its bid, the Bidder agrees that (i) the Owner's determination of whether a defect or irregularity affects the amount of the bid in any material respect or otherwise gives the Bidder a competitive advantage will be final and conclusive; and (ii) the Bidder will pay the Owner's attorneys' and consultants' fees related to any challenge to the bid procedure or process, brought directly or indirectly by the Bidder and/or any of its affiliates, which is unsuccessful.

R. MODIFICATION AND WITHDRAWAL OF BIDS

1. Modification: A Bidder may modify its bid by written communication to the Owner addressed to the Treasurer (with a copy delivered to the Director of Operations and the Design Professional, if any, at the addresses included in these Instructions to Bidders, at any time prior to the scheduled closing time for receipt of bids, provided such written communication is received by the Treasurer, prior to the bid opening time. The written communication must not reveal the bid price, but should provide the amount to be added to or subtracted from the base bid amount or other modification so that the final prices or terms will not be known until the sealed bid is opened.
2. Withdrawal prior to Bid Opening: A representative of the Bidder may withdraw its bid at any time for any reason prior to the scheduled bid opening established in the Notice to Bidders or addendum. The request to withdraw must be made in writing and submitted to the Treasurer, at the Owner's address.
3. Withdrawal after Bid Opening: A bidder may withdraw its bid after the scheduled bid opening time when all of the following apply:
    a. the price bid was substantially lower than the other bids;

b. the reason for the bid being substantially lower was a clerical mistake, rather than a mistake in judgment, and was due to an unintentional and substantial error in arithmetic or an unintentional omission of a substantial quantity of work, labor, or material;

c. the bid was submitted in good faith;

d. the Bidder provides written notice to the Owner, to the attention of the Treasurer (with a copy to the Director of Operations), within 2 business days after the bid opening for which the right to withdraw is claimed.

S. EQUAL EMPLOYMENT OPPORTUNITY/NONDISCRIMINATION

1. Minority, female, and disadvantaged businesses will be afforded full opportunity to submit bids, and bidders will not be discriminated against on the grounds of race, color, religion, sex, age, handicap, ancestry, or national origin in the consideration of an award. The successful bidder(s) must include a provision in any subcontract entered into for the Project that requires that each of its subcontractors not discriminate against any employee or applicant for employment on the basis of race, religion, color, sex, age, handicap, ancestry, or national origin in any actions that it takes. Such actions include, without limitation, employment, upgrading, demotion, transfer recruitment or recruiting advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeships.

2. The contract document to be executed by the successful Bidder contains nondiscrimination provisions as required by Ohio Revised Code Sections 153.59 and 153.60.

END OF INSTRUCTIONS TO BIDDERS

BID FORM

Project Name: **Bradford Exempted Village Schools**
New Athletic Facility

The undersigned, having read and examined the premises and the documents included in the Bid Package, including without limitation the Specifications, provided by the Owner for the Project, and the following Addenda:

Addendum Number	Date of Receipt
_____	_____
_____	_____
_____	_____

Contractor acknowledges that all Work must be completed within the time established in the Bid Package documents, and that each applicable portion of the Work must be completed upon the respective milestone completion dates, unless an extension of time is granted in accordance with the Contract Documents.

The undersigned Bidder proposes to perform all Work for the applicable Contract, in accordance with the Contract Documents, for the following sums:

ITEM 1. GENERAL CONTRACT BASE BID – Provide all labor and materials for a complete project as indicated in the documents for a new athletic facility.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-1: Construct the weight room slab on grade, walls, and interior finishes as indicated. Add mechanical, electrical and technology items as indicated.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-2: In lieu of sealed concrete, provide and install epoxy flake flooring in the home and visitor locker rooms and restroom areas.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-3: Provide and install a circular window with frosted glazing on the main façade in lieu of metal siding and insulation.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-4: In lieu of sealed concrete, install LVT plank flooring as indicated on the floor finish plans. LVT shall be Shaw Contract, Terrain II 20mil 5mm 4110V: Summit 05012.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-5: Provide and install 24 gage liner panels on the interior walls of the gymnasium. Provide all required trim around penetrations and openings.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-6: Provide and install 24 gage liner panels above the wall padding in the alternate weight room (Note: this item, if accepted, is additive to Alternate G-1.)

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate G-7: Provide and install an exterior metal stair complete with railings as indicated. Stair shall be based on model ST-53786 by StairZone (574-773-8025). Stair shall be factory powder coated.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

Alternate E-1: In lieu of the base bid extension of the existing Simplex Fire Alarm system, the fire alarm system shall be a stand-alone system by "Mircom" furnished by Secur-Com.

TOTAL LABOR AND MATERIALS, for the sum of $_____

Sum in words: _____

BIDDER'S CERTIFICATION

Bidder hereby acknowledges that the following representations in this bid are material and not mere recitals:

1. Bidder has read and understands the Contract Documents and agrees to comply with all requirements of the Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.
2. Bidder represents that the bid is based upon the Standards specified by the Contract Documents.
3. Bidder has visited the Project site, become familiar with local conditions and has correlated personal observations about the requirements of the Contract Documents. Bidder has no outstanding questions regarding the interpretation of the Contract Documents.
4. Bidder and each person signing on behalf of the Bidder certifies, and in the case of a joint or combined bid, each party thereto certifies as to such party's organization, under penalty of perjury, that to the best of the undersigned's knowledge and belief: (a) the Base Bid, any Unit Prices and any Alternate Bid in the bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate bid with any other Bidder; (b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate bid; (c) no attempt has been made or will be made by Bidder to induce any other individual, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.
5. Bidder will enter into and execute the Owner-Contractor Agreement with the Owner, if a Contract is awarded on the basis of this bid, and if the Bidder does not execute the Owner-Contractor Agreement for any reason, other than as authorized by law, Bidder and Bidder's Surety are liable to the Owner as provided in the Ohio Revised Code.
6. Bidder certifies that upon the award of a Contract, the Contractor will make a good faith effort to ensure that all of the Contractor's employees, while working on the site of the Project, will not purchase, transfer, use or possess illegal drugs or alcohol or abuse prescription drugs in any way.
7. Bidder agrees to furnish any information requested by the Owner to evaluate the responsibility of the Bidder.
8. The Bidder represents that the Bidder is not subject to a finding for recovery under Section 9.24, ORC, or that Bidder has taken the appropriate remedial steps required under Section 9.24, ORC, or otherwise qualifies under this section.

Each bid shall contain the name of every person interested therein. If Bidder is a corporation, partnership or sole proprietorship, an officer, partner or principal of Bidder, as applicable, shall print or type the legal name of Bidder on the line provided and **sign the Bid Form**. If Bidder is a joint venture, an officer, partner or principal, as applicable, of each member of the joint venture shall print or type the legal name of the applicable member on the line provided and sign the Bid Form.

BIDDER'S NAME:

Authorized Signature: _____

Print Name: _____ Title: _____

Company Name: _____ Where Incorporated: _____

Mailing Address: _____

Federal Tax ID Number: _____

Telephone Number: (____) _____ Fax Number: (___) _____

Contact person for Contract processing: _____

CONTRACTOR QUALIFICATIONS STATEMENT

[to be completed and submitted to Owner upon request after the bid opening]

SUBMITTED TO: Bradford Exempted Village Schools

SUBMITTED BY: _____

Name: _____

Address: _____

_____

Telephone: _____

Email: _____

Principal Office: _____

Indicate the form of organization: [ ] Corporation
[ ] Partnership
[ ] Individual
[ ] Joint Venture
[ ] Other

NAME OF PROJECT: _____

Complete the following information. Attach additional sheets as needed to provide the requested information.

1. ORGANIZATION

1.1 How many years has your organization been in business as a Contractor? _____

1.2 How many years has your organization been in business under its present business name? ____

1.2.1 Under what other or former names has your organization operated?

_____

_____

1.3 If your organization is a corporation, answer the following:

1.3.1 Date of incorporation: _____

1.3.2 State of incorporation: _____

1.3.3 President's name: _____

1.3.4 Vice President's name(s): _____

1.3.5 Secretary's name: _____

1.3.6 Treasurer's name: _____

1.4 If your organization is a partnership, answer the following:

1.4.1 Date of organization: _____

1.4.2 Type of partnership (if applicable): _____

1.4.3 Name(s) of general partner(s): _____

1.5 If your organization is individually owned, answer the following:

1.5.1 Date of organization: _____

1.5.2 Name of owner: _____

1.6 If the form of your organization is other than those listed above, describe it and name the principals:

_____

_____

_____

2. LICENSING

2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

_____

_____

2.2 List jurisdictions in which your organization's partnership or trade name is filed.

_____

_____

3. EXPERIENCE

3.1 List the categories of work that your organization normally performs with its own forces.

_____

3.2 Claims and Lawsuits (If the answer to any of the questions below is yes, please attach details.)

3.2.1 Has your organization ever failed to complete any work? _____

3.2.2 Within the last five (5) years has your organization or any of its officers initiated any Claims, had any Claims initiated against it or them, or been involved in or is currently involved in any mediation or arbitration proceedings or lawsuits suits related to any construction project, or has any judgments or awards outstanding against it or them? _____ If the answer is yes, please attach the details for each Claim, including the names and telephone numbers of the persons who are parties, the amount of the Claim, the type of Claim and basis for the Claim, and the outcome.

Note: As used in this document "Claim" means a Claim initiated under the Contract Documents for a project.

3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? _____ If the answer is yes, please attach details for each instance, including the names and telephone numbers of the persons who are parties to the contract, and the reason(s) the contract was not completed.

3.4 On a separate sheet, list construction projects your organization has in progress with an original Contract Sum of more than $100,000.00, giving the name of project, owner and its telephone number, design professional and its telephone number, contract amount, percent complete and scheduled completion date.

3.4.1 State total amount of work in progress and under contract: $_____

3.5 Provide the following information for each contract your organization has had during the last 5 years, including current contracts, where the Contract Sum is 50% or more of the bid amount for this Project, including add alternates. If there are more than 10 of these contracts only provide information on the most recent 10 contracts, including current contracts.

Project And Work	Contract Sum	Owner's Representative & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

3.5.1 Provide the following information for each project your organization has had during the last 5 years, which your organization believes is of comparable or greater size and complexity than the Owner's project. If there are more than 5 of these projects, only provide information on the most recent 5 projects, including current projects.

Project And Work	Contract Sum	Owner's Representative & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

3.5.2 State average annual amount of construction work your organization has performed during the last five years. $_____

3.5.3 If any of the following members of your organization's management--president, chairman of the board, or any director--operates or has operated another construction company during the last 5 years, identify the member of management and the name of the construction company.

_____

_____

3.5.4 If your organization is operating under a trade name registration with the Secretary of State for the State of Ohio, identify the entity for which the trade name is registered. If none, state "none."

_____

3.5.5. If your organization is a division or wholly-owned subsidiary of another entity or has another relationship with another entity, identify the entity of which it is a division or wholly-owned subsidiary or with which it has another relationship and also identify the nature of the relationship. If none, state "not applicable."

_____

3.6 On a separate sheet, list the construction education, training and construction experience for each person who will fill a management role on the Project, including without limitation the Project Executive, Project Engineer, Project Manager, and Project Superintendent. For each person listed, include with the other information the last three projects on which the person worked and the name and telephone number of the Design Professional and the Owner.

4. REFERENCES

4.1 Trade References: _____

_____

4.2 Bank References: _____

_____

4.3 Surety:

4.3.1 Name of bonding company: _____

4.3.2 Name and address of agent: _____

_____

5. FINANCING

5.1 Financial Statement

5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

- Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);
- Net Fixed Assets;
- Other Assets;
- Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes); and
- Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

5.1.2 Name and address of firm preparing attached financial statement, and date prepared:

_____

_____

5.1.3 Is the attached financial statement for the identical organization named on page one?

_____

5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary). _____

_____

5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction? _____

Certification. The undersigned certifies for the reliance of the Owner that after diligent investigation, to the best of the undersigned's belief, the information provided with this Contractor Qualifications Statement is true, accurate and not misleading.

SIGNATURE

Dated at this ____ day of _____, 20__.

Name of Organization: _____

By: _____[PRINT NAME]

Signature: _____

Title: _____

STATE OF OHIO,
County of _____, ss:

_____, being duly sworn, deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this _____ day of _____ 20_____.

_____
Notary Public

My Commission Expires: _____

SEAL

BID GUARANTY AND CONTRACT BOND

(O.R.C. § 153.571)

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned _____ _____ ("Contractor") as principal and _____ as surety are hereby held and firmly bound unto the Bradford Exempted Village School District Board of Education, Darke County, Ohio, as obligee in the penal sum of the dollar amount of the bid submitted by the principal to the obligee on _____ _____, 20__, to undertake _____ ("Project"). The penal sum referred to herein shall be the dollar amount of the principal's bid to the obligee, incorporating any additive or deductive Alternates made by the principal on the date referred to above to the obligee, which are accepted by the obligee. In no case shall the penal sum exceed the amount of ___ _____ Dollars ($_____). (If the foregoing blank is not filled in, the penal sum will be the full amount of the principal's bid, including add Alternates. Alternatively, if the blank is filled in the amount stated must not be less than the full amount of the bid including add Alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

Signed this _____ day of _____, 20____.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas the above named principal has submitted a bid for work on the Project.

Now, therefore, if the obligee accepts the bid of the principal and the principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the principal pays to the obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid and such larger amount for which the obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the principal pays to the obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect; if the obligee accepts the bid of the principal and the principal within ten (10) days after the awarding of the contract enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said contract is made a part of this bond the same as though set forth herein.

Now also, if the said principal shall well and faithfully do and perform the things agreed by said principal to be done and performed according to the terms of said contract; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; and surety shall indemnify the obligee against all damage suffered by failure of the principal to perform the contract according to its provisions and in accordance with the plans, details, specifications, and bills of material therefor and to pay all lawful claims of subcontractors, materialmen, and laborers for labor performed or material furnished in carrying forward, performing, or completing the contract and surety further agrees and assents that this undertaking is for the benefit of any subcontractor, materialman, or laborer having a just claim, as well as for the obligee; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions, or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in any wise affect the obligations of said surety on its bond, and does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

Signed and sealed this _____ day of _____.

(PRINCIPAL)

_____

By: _____

Printed Name & Title: _____

(SURETY)

_____

By: _____

Printed Name & Title: _____

Surety's Address: _____

_____

Surety's Telephone Number: _____

Surety's Fax Number: _____

Surety's Email Address: _____

_____
NAME OF SURETY'S AGENT

Surety's Agent's Address: _____

_____

Surety Agent's Telephone Number: _____

Surety Agent's Fax Number: _____

Surety Agent's Email Address: _____

CONTRACT BOND

(O.R.C. § 153.57)

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned ("Contractor") as principal and as surety, are hereby held and firmly bound unto the Bradford Exempted Village School District Board of Education, located in Darke County, Ohio, (together referred to as the "Board") as obligee, in the penal sum of

_____ Dollars ($_____), for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

Signed this _____ day of _____, 20__.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas, the above-named principal did on the _____ day of _____, 20__, enter into a contract with the Board for the _____ _____ (“Project”), which said contract is made a part of this bond the same as though set forth herein:

Now, if the said Contractor shall well and faithfully do and perform the things agreed by the Contractor to be done and performed according to the terms of said contract; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions, or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in any wise affect the obligations of said surety on its bond, and does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

Signed and sealed this ____ day of _____, 20__.

_____	_____
(PRINCIPAL)	(SURETY)
By: _____	By: _____
Printed Name & Title: _____	Printed Name & Title: _____
_____	_____
	Surety's Address: _____
_____	_____
_____	
	Surety's Tel. Number: _____
	Surety’s Fax Number:_____
_____	
	Surety’s Email Address: _____

NAME OF SURETY'S AGENT

Surety Agent's Address: _____

_____

Surety Agent's Tel. Number:_____

Surety Agent's Fax Number:_____

DELINQUENT PERSONAL PROPERTY TAXES

TO:

I submitted a bid to _____ on _____, 20___, and having been awarded the contract described as (Insert contract number or a brief description of the work or service to be performed), submit statement to comply with the requirement of Section 5719.042, Ohio Revised Code.

NOTE: If paragraph No. 1 below is applicable, the bidder should sign in the space provided at the end of the paragraph, and then cross out paragraph No. 2.

If paragraph No. 2 below is applicable, the bidder should insert the requested information and then cross out paragraph No. 1.

No. 1: At the time I submitted my bid I was not charged with any delinquent personal property taxes on any general tax list.

_____
NAME OF FIRM

_____
Signature of Officer (Title)

No. 2: At the time I submitted my bid I was charged with delinquent personal property taxes, penalties and interest as follows:

$_____ Delinquent Taxes

$_____ Penalties

$_____ Interest

_____
NAME OF FIRM

_____
Signature of Officer (Title)

State of Ohio
County of _____ SS:

_____, being first duly sworn, says that the statements made above are true as he/she verily believes.

Sworn to before me and subscribed in my presence this _____ day of _____, 20___.

_____
Notary Public

NON-COLLUSION AFFIDAVIT

State of Ohio, County of _____.

The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a joint bid, each party thereto certifies as to such party's organization, under penalty of perjury, that to the best of the undersigned's knowledge and belief.

1. The Base Bid, Unit Prices or any Alternate bid in the bid have been arrived at independently without collusion, consultation, communication or agreement, for the purposes of restricting competition as to any matter relating to such Base Bid, Unit Prices, or Alternate bid with any other Bidder.

2. Unless otherwise required by law, the Base Bid, Unit Prices or Alternate bid which have been quoted in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other bidder that would have any interest in the Base Bid, Unit Prices, or Alternate Bid.

3. No attempt has been made or will be made by the Bidder to induce any other individual, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

Authorized Signature: _____

Print Name: _____

Title: _____

Company Name: _____

ADDITIONAL SIGNATURE FOR JOINT VENTURE

Authorized Signature: _____

Print Name: _____

Title: _____

Company Name: _____

State of Ohio, County of _____ ss.

Sworn to and subscribed before me this _____ day of _____, 20_____.

_____
Notary Public

OWNER-CONTRACTOR AGREEMENT

AIA form A101 – Standard form of Agreement Between Owner and Contractor – Stipulated Sum

Draft agreement as attached.

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 Sixth day of July in the year Two Thousand Twenty-Six
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Bradford Exempted School District
760 Railroad Avenue
Bradford, OH 45308
937-448-2770

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

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

263401.00 Bradford Schools Multipurpose Facility
760 Railroad Avenue
Bradford, OH 45308
New Multipurpose Athletic facilty for Bradford Schools located at 760 Railroad Avenue, Bradford Ohio 45308.

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

Levin Porter Associates Inc
3011 Newmark Drive
Miamisburg, OH 45342
937-224-1931

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes 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 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.

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.

DRAFT

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User Notes: (6a4c0bb7842e1eaf949e6400)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

[X] 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.

[X] By the following date:

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§ 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 Zero Dollars and Zero Cents ($ 0.00), 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:

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§ 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

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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:

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(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 a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, 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** Building information modeling exhibit, dated as indicated below:
  (Insert the date of the building information modeling exhibit incorporated into this Agreement.)

- **.5** Drawings

Number	Title	Date

- **.6** Specifications

Section	Title	Date	Pages

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.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)*

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Additions and Deletions Report for
AIA® Document A101® – 2017

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 20:11:52 EDT on 07/06/2026.

Changes to original AIA text

There are no edits to the original text

Variable Information

PAGE 1

AGREEMENT made as of the Sixth day of July in the year Two Thousand Twenty-Six
(In words, indicate day, month and year.)

Bradford Exempted School District

760 Railroad Avenue
Bradford, OH 45308

937-448-2770

263401.00 Bradford Schools Multipurpose Facility

760 Railroad Avenue
Bradford, OH 45308

New Multipurpose Athletic facilty for Bradford Schools located at 760 Railroad Avenue, Bradford Ohio 45308.

Levin Porter Associates Inc

3011 Newmark Drive
Miamisburg, OH 45342

937-224-1931

PAGE 2

[ ] The date of this Agreement.

[X] 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.)

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

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[X] By the following date:

PAGE 3

§ 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 Zero Dollars and Zero Cents ($ 0.00), subject to additions and deductions as provided in the Contract Documents.

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GENERAL CONDITIONS of the CONTRACT FOR CONSTRUCTION

AIA A201 – General Conditions of the Contract for Construction.

AIA® Document A201® – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
263401.00 Bradford Schools Multipurpose Facility
760 Railroad Avenue
Bradford, OH 45308

THE OWNER:
(Name, legal status and address)
Bradford Exempted School District
760 Railroad Avenue
Bradford, OH 45308

THE ARCHITECT:
(Name, legal status and address)
Levin Porter Associates Inc
3011 Newmark Drive
Miamisburg, OH 45342

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes 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 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.

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7, 14.1, 15.2
Addenda
1.1.1, 3.11
Additional Costs, Claims for
3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.5**
Additional Insured
11.1.4
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.5**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8, 7.3.8
All-risk Insurance
11.3.1, 11.3.1.1
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.6.3, 9.7, 9.10, 11.1.3
Approvals
2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1
Arbitration
8.3.1, 11.3.10, 13.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.4, 3.12.7, 4.1, 4.2, 5.2, 6.3, 7.1.2, 7.3.7, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2
Architect's Additional Services and Expenses
2.4, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.4, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1, 5.2.1, 11.4.1
Binding Dispute Resolution
9.7, 11.3.9, 11.3.10, 13.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1
Boiler and Machinery Insurance
11.3.2
Bonds, Lien
7.3.7.4, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.7.4, 9.6.7, 9.10.3, 11.3.9, **11.4**
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment

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4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3
Certificates of Inspection, Testing or Approval
13.5.4
Certificates of Insurance
9.10.2, 11.1.3
Change Orders
1.1.1, 2.4, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.1, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.3.9
Claims, Definition of
15.1.1
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, **15.1.4**
Claims for Additional Time
3.2.4, 3.7.4, 6.1.1, 8.3.2, 10.3.2, **15.1.5**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Claims Subject to Arbitration
15.3.1, 15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1, 15.1.4
Commencement of the Work, Definition of
8.1.2
Communications Facilitating Contract Administration
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7
Compliance with Laws
1.6, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.3
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE
5.4.1.1, 11.3.9, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.2.5, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, **9.1**, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5
Contract Sum, Definition of
9.1
Contract Time
3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction Schedules
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contractor's Employees
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4
Contractor's Relationship with Subcontractors

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1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8
Contractor's Relationship with the Architect
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
9.7
Contractor's Right to Terminate the Contract
14.1, 15.1.6
Contractor's Submittals
3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3
Contractual Liability Insurance
11.1.1.8, 11.2
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.2.5, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.7
Costs
2.4, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 11.3.1, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Damages for Delay
6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.3, 2.4, 3.5, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1
Delays and Extensions of Time
3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.5, 15.2.5
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2, 11.1.2
Emergencies
10.4, 14.1.1.2, 15.1.4
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1
Equipment, Labor, Materials or
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.5, 15.2.5
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
Fire and Extended Coverage Insurance
11.3.1.1
GENERAL PROVISIONS
1
Governing Law

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13.1
Guarantees (See Warranty)
Hazardous Materials
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7
Information and Services Required of the Owner
2.1.2, **2.2**, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2
Instruments of Service, Definition of
1.1.7
Insurance
3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, **11**
Insurance, Boiler and Machinery
11.3.2
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 11.1.2
Insurance, Loss of Use
11.3.3
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, **11.3**
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4
Interest
13.6
Interpretation
1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12, 15.1.4
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 13.7, 15.4.1.1
Limitations of Liability
2.3, 3.2.2, 3.5, 3.12.10, 3.17, 3.18.1, 4.2.6, 4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2
Limitations of Time
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15
Loss of Use Insurance
11.3.3
Material Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 15.2.8
Mediation
8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1
Minor Changes in the Work
1.1.1, 3.12.8, 4.2.8, 7.1, **7.4**
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2, 11.3.1
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.3, 2.4, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2.1

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Notice
2.2.1, 2.3, 2.4, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7, 9.10, 10.2.2, 11.1.3, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1
Notice, Written
2.3, 2.4, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, **13.3**, 14, 15.2.8, 15.4.1
Notice of Claims
3.7.4, 10.2.8, **15.1.2**, 15.4
Notice of Testing and Inspections
13.5.1, 13.5.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.2.2, 9.6.6, 9.8, 11.3.1.5
Orders, Written
1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Information and Services Required of the
2.1.2, **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Owner's Authority
1.5, 2.1.1, 2.3, 2.4, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Financial Capability
2.2.1, 13.2.2, 14.1.1.4
Owner's Liability Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.4, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.3
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**, 11.3.1.5
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 12.3, 13.7, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.7.4, 9.6.7, 9.10.3, **11.4**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.7.4, 9.6.7, 9.10.3, **11.4**
Permits, Fees, Notices and Compliance with Laws
2.2.2, **3.7**, 3.13, 7.3.7.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.3
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.3**
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4
Rejection of Work
3.5, 4.2.6, 12.2.1
Releases and Waivers of Liens
9.10.2
Representations
3.2.1, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2, 9.10.1
Representatives

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2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor
3.12
Rights and Remedies
1.1.2, 2.3, 2.4, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, **13.4**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5
Special Inspections and Testing
4.2.6, 12.2.1, 13.5
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14
Statute of Limitations
13.7, 15.4.1.1
Stopping the Work
2.3, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3.7**
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 13.7
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
4.1.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3
Surety
5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7
Surety, Consent of
9.10.2, 9.10.3
Surveys
2.2.3
Suspension by the Owner for Convenience
14.3
Suspension of the Work
5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.7.4
Termination by the Contractor
14.1, 15.1.6
Termination by the Owner for Cause
5.4.1.1, **14.2**, 15.1.6
Termination by the Owner for Convenience
14.4
Termination of the Architect

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4.1.3
Termination of the Contractor
14.2.2
TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1, 12.2.1, **13.5**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.5, 15.2.5
Time Limits
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4
Time Limits on Claims
3.7.4, 10.2.8, **13.7**, 15.1.2
Title to Work
9.3.2, 9.3.3
Transmission of Data in Digital Form
1.6
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 7.3.4
Use of Documents
1.1.1, 1.5, 2.2.5, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.4.2
Waiver of Claims by the Contractor
9.10.5, 13.4.2, 15.1.6
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6
Waiver of Consequential Damages
14.2.4, 15.1.6
Waiver of Liens
9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3.7**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7
Weather Delays
15.1.5.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Notice
2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 12.2.2, 12.2.4, **13.3**, 14, 15.4.1
Written Orders
1.1.1, 2.3, 3.9, 7, 8.2.2, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

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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 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 and certify termination of the Agreement under Section 14.2.2.

§ 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.

§ 1.2.2 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

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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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

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 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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§ 2.2.2 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.

§ 2.2.3 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.

§ 2.2.4 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.

§ 2.2.5 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.

§ 2.3 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.

§ 2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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 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 2.2.3, 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

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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 make 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required 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 authorized by the Architect in accordance with Sections 3.12.8 or 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.

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§ 3.5 WARRANTY

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.

§ 3.6 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 21 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 an equitable adjustment 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 in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed 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;

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.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 furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply 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 SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be 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, 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 maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be 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.

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§ 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 the way by which 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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing 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 written 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. 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 cause such services or certifications to be provided by a properly 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, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 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, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber

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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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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 such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's 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 or 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 Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect 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 such 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 the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such 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 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.

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§ 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.

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

§ 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, except as provided in Section 3.3.1.

§ 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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) 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 FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 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 13.5.2 and 13.5.3, whether or not such 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, material and equipment 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, unless otherwise specifically stated by the Architect, 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.

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§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 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 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply 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

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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 previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, 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, which the Contractor, by these 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 in writing; 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 such 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 Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the 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.

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§ 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor 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 report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report 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, except as to defects not then reasonably discoverable.

§ 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 the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors 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, and the Contractor shall proceed promptly, 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.

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§ 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 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 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.

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and 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 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.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 related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 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.

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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 has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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

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.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various

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portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material 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 material 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, material suppliers, or other persons or entities making a claim by reason of having 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 issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part 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 comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. 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. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. 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 material 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

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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 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 the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 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 material or equipment suppliers 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 Architect will reflect such payment on the next Certificate 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 material and equipment 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 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, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

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§ 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' written 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 shut-down, 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, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 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.

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§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written 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 and, 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 terms and conditions of 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, 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 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 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; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material 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 or the Contractor's Subcontractors or Sub-subcontractors; and

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.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 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 owners and users of adjacent sites and utilities.

§ 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, except damage or loss 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, written notice of such 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

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written 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 such material or substance or who are to perform the task of removal or safe containment of such 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 in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

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§ 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 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify 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 LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

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§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

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§ 11.3.2 BOILER AND MACHINERY INSURANCE
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE
The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION
The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

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§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 an 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 written 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 2.4.

§ 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.

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§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors 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 except that, 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 such 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 such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 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.

§ 13.4.2 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 there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 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 (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

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§ 13.5.2 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 13.5.1, 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 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 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.

§ 13.5.5 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.

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

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 13.7.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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 promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

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§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .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 above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written 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 as described in 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 written 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

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.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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written 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 must 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 CONTINUING CONTRACT PERFORMANCE

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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

§ 15.1.6 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

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§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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 15.1.6 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

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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 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. 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 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.

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AIA® Document A201® – 2007

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Changes to original AIA text

There are no edits to the original text

Variable Information

PAGE 1

for the following PROJECT:
(Name and location or address)
263401.00 Bradford Schools Multipurpose Facility
760 Railroad Avenue
Bradford, OH 45308

THE OWNER:
(Name, legal status and address)
Bradford Exempted School District
760 Railroad Avenue
Bradford, OH 45308

THE ARCHITECT:
(Name, legal status and address)
Levin Porter Associates Inc
3011 Newmark Drive
Miamisburg, OH 45342

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_____

(Signed)

_____

(Title)

_____

(Dated)

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SECTION 010090

REVIT AND CAD RELEASE

Revit and CAD release as attached.

LEVIN PORTER ARCHITECTS

PRINCIPALS

Mark C. Wiseman
AIA, LEED AP

Matthew T. Franklin
AIA, LEED AP BD+C

SENIOR ASSOCIATES

Michael Huff
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Veronica Pochet
AIA, LEED AP BD+C
WELL AP, CPHC

Jordan Reed
AIA, NCARB, NCIDQ

ASSOCIATE

Robert Brown
AIA, NCIDQ

January 2026

RE: AutoCAD/Revit Data Files
Bradford Exempted Village Schools
New Athletic Facility
LPA Project No. 263401.00

Dear Contractor:

You have requested a Revit model file(s) or AutoCad file for the above referenced job. We are happy to furnish this to you under the conditions herein below set forth:

- You are requesting this model solely for the purpose of coordinating and expediting your work on this specific project and for no other purpose.

- The file(s) on provided are not Contract Drawings; they are work product tools used to produce the Contract Drawings. As such, they may contain information that may or may not be consistent with the Contract Drawings.

- Ownership of the information to be provided to you as herein set forth is and shall remain the sole and exclusive property of Levin Porter Associates Inc.

- Levin Porter Associates Inc makes no representation or warranty, expressed or implied, as to the quality or content of the information of these files.

Upon the signature below by an authorized representative of your organization which constitutes acceptance of the above terms under which files noted are being tendered to you, and return of the signed letter, we will immediately forward the requested information to you.

_____

Name Company

Sincerely,

AIA

Certified Green Business

Matt Franklin, AIA

LEVIN PORTER ASSOCIATES, INC.
3011 NEWMARK DRIVE MIAMISBURG, OHIO 45342
O: 937.224.1931 F:937.224.3091
www.levin-porter.com

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Bradford EVSD - Athletic Facility

B. Owner's Name: Board of Education: Bradford EVSD.

C. The Project consists of the construction of a new athletic facility.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005000 - Contracting Forms and Supplements.

B. Primary construction features include but are not limited to the following:
   1. Site work:
      a. Building pad preparation.
      b. Site utilities
      c. Foundation excavations.
      d. Removal of noted site items including pavement, sidewalks, miscellaneous electrical items and an existing light pole base.
   2. Plumbing systems provision and installation.
   3. Mechanical systems provision and installation.
   4. Fire protection system provision and installation.
   5. Electrical systems provision and installation.
   6. Structural:
      a. Poured concrete footings, foundations and slab on grade.
      b. Pre-engineered metal building system and components as specified.
   7. Architectural:
      a. Exterior and interior finishes.
      b. Interior wall assemblies.
      c. Doors and hardware.
      d. Toilet accessories.
      e. Athletic equipment.
      f. Locker room lockers.
      g. Acoustical ceilings.

1.03 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
   1. Access controls.
   2. Security cameras.
   3. Wireless access points.
   4. Data devices.
   5. Ice maker in training room.
   6. Toilet accessories.

B. The District reserves the right to engage other contractors for separate work not identified under this contract. The Contract responsible for the work as specified herein shall coordinate with the Owner contractor as necessary to facilitate the work and to maintain the project schedule.

1.04 PROJECT SCHEDULE

A. Project Schedule is as follows:

B. It is the intension to award the project on August 12, 2026.

C. Notice to Proceed issued on August 13, 2026.

D. Substantial Completion: June 15, 2027.

E. Final Completion: June 30, 2027.

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas of the site identified in the pre-construction meeting..
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. All work can begin at the site as authorized by the Owner and after the Notice to Proceed.

C. The Contractor shall order all equipment and materials associated with the work in order to be completed by the substantial completion date listed above.

D. Note: The building and zoning permits will be applied and paid for by the Owner.

E. Access to all emergency egress and exits shall be maintained at all times throughout the project.

F. The project area will be available to the Contractors during the holiday breaks with prior approval of the Owner.

G. The Contractor, at their option and at no additional cost to the Owner, may work on Saturdays and Sundays with prior approval of the Owner.

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

I. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012300
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. G-1: Weight Room.
   1. Alternate: Construct the weight room slab on grade, walls, and interior finishes as indicated. Add mechanical, electrical and technology items as indicated.

B. Alternate No. G-2: Epoxy flake flooring in locker rooms.
   1. Alternate: In lieu of sealed concrete, provide and install epoxy flake flooring in the home and visitor locker rooms and restroom areas.

C. Alternate No. G-3: Circular window on main façade.
   1. Alternate: Provide and install a circular window with frosted glazing on the main façade in lieu of metal siding and insulation.

D. Alternate No. G-4: LVT flooring in main entrance lobby.
   1. Alternate: In lieu of sealed concrete, install LVT plank flooring as indicated on the floor finish plans. LVT shall be Shaw Contract, Terrain II 20mil 5mm 4110V: Summit 05012.

E. Alternate No. G-5: Interior metal liner panels in gymnasium.
   1. Alternate: Provide and install 24 gage liner panels on the interior walls of the gymnasium above the CMU wainscot. Provide all required trim around penetrations and openings.

F. Alternate No. G-6: Interior metal liner panels in weight room.
   1. Alternate: Provide and install 24 gage liner panels above the wall padding in the alternate weight room (Note: this item, if accepted, is additive to Alternate G-1.)

G. Alternate No. G-7: Exterior stair.
   1. Alternate: Provide and install an exterior metal stair complete with railings as indicated. Stair shall be based on model ST-53786 by StairZone (574-773-8025). Stair shall be factory powder coated.

H. Alternate No. E-1: Stand-alone fire alarm system.
   1. Alternate: In lieu of the base bid extension of the existing Simplex Fire Alarm system, the fire alarm system shall be a stand-alone system by “Mircom” furnished by Secur-Com.

END OF SECTION 012300

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 012300 - Alternates, for product alternatives affecting this section.

C. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 RESOLUTION

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

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions: Dates for applications for payment.
B. Section 016000 - Product Requirements: General product requirements.
C. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.
D. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
B. Make the following types of submittals to Architect:
    1. Requests for Interpretation (RFI).
    2. Requests for substitution.
    3. Shop drawings, product data, and samples.
    4. Test and inspection reports.
    5. Design data.
    6. Manufacturer's instructions and field reports.
    7. Applications for payment and change order requests.
    8. Progress schedules.
    9. Coordination drawings.
    10. Correction Punch List and Final Correction Punch List for Substantial Completion.
    11. Closeout submittals.

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. Web based project management software or other electronic document manament services are optional and not required. However, it is the Contractor's responsibility to keep accurate and organized records and documentation including but not limited to shop drawings, addenda, bulletins, ASIs, and as-builts in order to properly execute and manage the construction.
   2. 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.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants will 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. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, _____ and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

D. The Architect will record meeting minutes and will distribute copies electronically to all participants and other designated team members within two days after the meeting.

3.03 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. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's superintendent.
   5. Major subcontractors.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFIs log and status of responses.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
   10. Planned progress during succeeding work period.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to 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 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.05 COORDINATION DRAWINGS

A. Review drawings prior to submission to Architect.

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 using software provided by the Electronic Document Submittal Service.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   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.

H. Review Time: Architect will respond and return RFIs to Contractor within 5 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.

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.

3.07 SUBMITTAL SCHEDULE

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

3.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Shop drawings.
   4. Samples for selection.
   5. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in 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 017800 - Closeout Submittals.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   5. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   7. Provide space for Contractor and Architect review stamps.
   8. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting 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. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.12 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Approved", or language with same legal meaning.
b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 013100
PROGRESS SCHEDULE

PART 1 - GENERAL

1. RELATED DOCUMENTS

   All provisions of the Contract Documents apply to this Section. The Contractor(s) shall be responsible for complete familiarity of same.

2. REQUIREMENTS INCLUDE

   A. Procedures for preparation and submittal of construction progress schedules and periodical updating.

   B. Contractors other than the General Contractor shall furnish, in a timely manner, detailed information required for preparation of the progress schedule by the General Contractor.

3. RELATED REQUIREMENTS

   A. Specified elsewhere:

      1. Section 013400 - Shop Drawing, Product Data and Samples.

4. FORMAT

   A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of work or operation, identifying first workday of each week.

   B. Sequence of Listings: The Table of Contents of project manual.

   C. Scale and Spacing: To provide space for notations and revisions.

   D. Sheet Size: Minimum 8.5” x 11” or 11" x 17"

5. CONTENT

   A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction. Indicate delivery dates for material and equipment critical to the progress of the work.

   B. Identify each item by major specification section number.

   C. Identify work of separate stages and other logically grouped activities.

   D. Provide sub-schedules for each stage of work.

   E. Provide sub-schedules to define critical portions of entire schedule.

   F. Show accumulated percentage of completion of each item and total percentage of work complete, as of the first day of each month.

   G. Provide separate schedule of submittal dates for shop drawings, product data, and samples and dates reviewed submittals will be required from Architect. Show decision dates for selection of finishes.

6. REVISIONS TO SCHEDULES

   A. Indicate progress of each activity to date of submittals and projected completion date of each activity.

   B. Identify activities modified since previous submittal, major changes in scope and other identifiable changes.

   C. Provide narrative report to define problem areas, anticipated delays and impact on schedule. Report corrective action taken, or proposed and its effect.

7. SUBMITTALS

   A. Submit initial schedules within 15 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within ten days.

   B. Submit revised Progress Schedule with each Application for Payment.

   C. Submit the number of opaque reproductions which Contractor requires, plus 3 copies which will be retained by Architect. Submit under transmittal letter. (note: electronic submission of applications for payment and the schedule will be acceptable.)

8. DISTRIBUTION

   A. Distribute copies of review schedules to job site file, subcontractors, other contractors, suppliers and other concerned entities.

   B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION

SECTION 013400
SHOP DRAWINGS, PRODUCT DATA & SAMPLES

PART 1 - GENERAL

1. RELATED DOCUMENTS

   All provisions of the Contract Documents apply to this Section. The Contractor(s) shall be responsible for complete familiarity of same.

2. REQUIREMENTS INCLUDE

   A. Procedures for submittals.

3. RELATED REQUIREMENTS

   A. Specified elsewhere:

      1. General Conditions: Definitions and basic responsibilities of entities.

      2. Section 013100 - Progress Schedules

      3. Section 017000 - Project Close-Out

4. SHOP DRAWINGS

   A. Present in a clear and thorough manner. Title each drawing with project and contract name and number; identify each element of drawings by reference to sheet number and detail, schedule or room number of Contract Documents.

   B. Identify field dimensions, show relation to adjacent or critical features of work or products.

   C. Minimum Sheet Size: 11" x 17" or multiples of 8-1/2" x 11".

   D. Reproduction of Contract Documents are not acceptable as shop drawings.

5. PRODUCT DATA

   A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics and capacities, wiring and piping diagrams and controls, component parts, finishes, dimensions and required clearances.

   B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to work. Delete information not applicable.

6. SAMPLES

   A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures and patterns for Architect selection.

   B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples which may be used in the work area indicated in specification sections.

D. Label each sample with identification required for transmittal letter.

E. Provide field samples of finishes at project, at location acceptable to Architect, as required by individual specification sections. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work.

F. Submit for approval two (2) samples, or as otherwise required by the specifications.

7. MANUFACTURER'S INSTRUCTIONS

A. Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, balancing and finishing.

8. CONTRACTOR REVIEW

A. Review submittals prior to transmittal, determined and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of contract documents.

B. Coordinate submittals with requirements of work and of contract documents.

C. Sign or initial each sheet of shop drawings and product data and each sample label to certify compliance with requirements of contract documents. Notify Architect in writing at time of submittals, of deviations from requirements of contract documents.

D. Do not fabricate products or begin work which requires submittals until return of submittal with Architect acceptance.

9. SUBMITTALS REQUIREMENTS

A. Transmit submittals in accord with approved Progress Schedule.

B. Provide 8" x 4" blank space on each submittal for Contractor and Architect stamps.

C. Apply Contractor's stamp, signed or initialed, certifying to review, verification of products, field dimensions and field construction criteria, and coordination of information with requirements of work and contract documents.

D. Coordinate submittals into logical groupings to facilitate interrelation of several items:

1. Finishes which involve Architect selection of colors, textures or patterns.

2. Associated items which require correlation for efficient function or for installation.

E. Original submission of shop drawings as required by the contract shall be in the form of one set of reproducible transparencies, such as ozalid, sepias and one set of prints. Standard mass produced items may be catalog cuts of which Contractor has had a reproducible transparency prepared, except in the instance of items especially adapted for this project. NOTE: electronic submission of shop drawings is encouraged and preferred.

F. Submit number of samples specified in individual specification sections.

G. Submit under Architect accepted form transmittal letter. Identify project by title and number, identify contract by number. Identify work and product by specifications section and article number.

H. Contractor shall submit 2 copies of submittals to Owner at the same time the original submission is made to Architect.

I. During the checking of shop drawings, phone conversations with Contractors, etc., if any revisions are being made to the contract documents, make a written record for all revisions to the drawings/specifications (for Record Drawings/Record Addendum), note the revisions in red, on the stick set of drawings/specifications and file the written record in the "Record Drawing and Record Addendum" section of the job notebook.

10. RESUBMITTALS

A. Make resubmittals in accordance with requirements for initial submittals, clearly identify changes made since previous submittal.

11. DISTRIBUTION

A. Duplicate and distribute reproductions of shop drawings, copies of product data and samples, which bear Architect stamp of approval, to job site file, Record Documents file, subcontractors, suppliers, other affected Contractors, and other entities requiring information.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION

SECTION 015100
TEMPORARY FACILITIES & CONTROLS

1. RELATED DOCUMENTS

All provisions of the Contract Documents apply to this section. The Contractors shall be responsible for complete familiarity with same.

2. BARRICADES

A. The Contractor shall furnish and erect a temporary fence to secure the construction site. This fence shall be maintained at all times and shall consist of a minimum height of 6’-0” chain-link. Signage shall be posted every 50ft around the perimeter of the fence indicating “DANGER: CONSTRUCTION ZONE. KEEP OUT.”.

B. The contractor shall employ temporary traffic control barriers and signage as required to prevent the general public from entering the work zone. Temporary traffic control measures shall be consistent with ODOT guidelines.

3. CONSTRUCTION OFFICE AND SHEDS

A. Each Contractor, at their option, shall provide and maintain adequate field office facilities with table, racks and filing cabinets to suitably accommodate the Drawings, Specifications and Shop Drawings, and each Contractor shall install and maintain a telephone with outside signal and answering machine.

B. Each Contractor shall provide his own enclosures, tool sheds, etc., as required for storage of his materials. Extent and location shall be subject to approval by the Owner. Maintain storage off site where possible to ease congestion.

4. TEMPORARY TOILETS

A. Temporary toilet facilities shall be provided by the contractor as part of this project. Existing toilet facilities are not available for use by the contractors.

5. TEMPORARY WATER SUPPLY

A. The contractor shall arrange and pay for water as required to complete the work.

6. TEMPORARY LIGHT AND POWER

A. The contractor shall arrange and pay for temporary lighting as required to complete the work.

B. The Contractor shall provide temporary light for construction purposes for use by all Contractors. Lighting shall conform to OSHA guidelines currently in effect.

C. Individual Contractors shall be responsible for any special voltage or power requirements which they may require and shall provide necessary auto transformers and electrical extension to available panelboard locations.

D. The Contractor shall furnish all lamps and temporary lighting as required to facilitate construction and create a safe working environment. The contractor shall pay for power usage. Any additional lamps required during the entire construction period shall be furnished by the Contractor.

7. TEMPORARY UTILITIES

A. Temporary utilities shall be installed in such a manner as not to interfere with work of other trades or the permanent construction. If such interference does occur, it shall be the responsibility of the Contractor causing interference to make any changes required to overcome the interference. The cost of these changes shall be borne by the Contractor.

8. CONSTRUCTION EQUIPMENT

A. The Contractor shall furnish and maintain all equipment such as ladders, ramps, scaffolding requirements, derricks, chutes, etc. required for proper execution of the work. The Contractor shall permit other Contractors or Subcontractors to use equipment provided by him. All equipment shall be maintained in proper condition, properly grounded and operated.

9. WATCHMAN

A. The Contractors may, at their option, employ a watchman to guard the premises when the workmen are not on the job. Each Contractor will be responsible for all damages or loss of material on his work under construction including theft or vandalism during the entire construction period, whether or not a watchman is employed.

10. WEATHER PROTECTION

A. It is the intent of these Specifications to have each Contractor protect his work and existing or adjacent property against weather, rain, water, wind, storms, frost or heat to maintain his work, material, apparatus, fixtures, free from injury or damage in accordance with the General Conditions. Work likely to be damaged shall be covered at the end of each day's work. Any work damaged by failure to provide protection above required, shall be removed and replaced with new work at the Contractor's expense.

11. TRASH

A. The Contractor shall be responsible for providing trash containers throughout the project for use by all Contractors, and shall also provide a single large dumpster within the staging area; the General Contractor shall be responsible for all waste handling procedures and final disposal.

12. OTHER CONTRACTS

A. The Owner may conduct his own maintenance, renovation or construction projects using his own labor in this and/or other areas of the site. Access to these areas through the construction site shall be provided by the Contractor.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transportation, handling, storage and protection.

B. Product option requirements.

C. Substitution limitations.

D. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.
   2. If wet-applied, have lower VOC content, as defined in Section 016116.

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.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.

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. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 016100
TRANSPORTATION AND HANDLING

PART 1 - GENERAL

1. RELATED DOCUMENTS

   All provisions of the Contract Documents apply to this Section. The Contractor(s) shall be responsible for complete familiarity of same.

2. REQUIREMENTS INCLUDE

   A. Packaging, transportation.
   B. Delivery and receiving.
   C. Product handling.

3. RELATED REQUIREMENTS

   A. Specified elsewhere:

      1. Section 013100 - Progress Schedules
      2. Section 013400 - Shop Drawings, Product Data and Samples
      3. Section 016200 - Storage and Protection
      4. Individual Sections - Specific requirements for packaging, shipping and handling.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

1. PACKAGING, TRANSPORTATION

   A. Require supplier to package products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture.

   B. Protect sensitive equipment and finishes against impact, abrasion and other damage.

2. DELIVERY AND RECEIVING

   A. Arrange deliveries of products in accord with construction progress schedules. Allow time for inspection prior to installation.

   B. Coordinate deliveries to avoid conflict with work and conditions at site, work of other Contractors, limitations on storage space, availability of personnel handling equipment and Owner's use of premises.

   C. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

   D. Clearly mark partial deliveries of component parts of equipment to identify equipment and content to permit easy accumulation of parts to facilitate assembly.

E. Immediately on deliver, inspect shipment to assure:

1. Product complies with requirements of contract documents and reviewed submittals.

2. Quantities are correct.

3. Accessories and installation hardware are correct.

4. Containers and packages are intact and labels legible.

5. Products are protected and undamaged.

3. PRODUCT HANDLING

A. Provide equipment and personnel to handle products, by methods to prevent soiling and damage.

B. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

C. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

END OF SECTION

SECTION 016200
STORAGE AND PROTECTION

PART 1 - GENERAL

1. RELATED DOCUMENTS

   All provisions of the Contract Documents apply to this Section. The Contractor(s) shall be responsible for complete familiarity of same.

2. REQUIREMENTS INCLUDE

   A. Storage, general.
   B. Enclosed storage.
   C. Exterior storage.
   D. Maintenance of storage.

3. RELATED REQUIREMENTS

   A. Specified elsewhere:

      1. Section 016100 - Transportation & Handling
      2. Section 017000 - Project Close-Out

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

1. STORAGE, GENERAL

   A. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

   B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

2. ENCLOSED STORAGE

   A. Store products, subject to damage by the elements, in substantial weathertight enclosures.

   B. Maintain temperature and humidity within ranges stated in manufacturer's instructions.

   C. Provide humidity control and ventilation for sensitive products required by manufacturer's instructions.

   D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3. EXTERIOR STORAGE

   A. Provide substantial platforms, blocking or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

   B. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

   C. Provide surface drainage to prevent erosion and ponding of water.

   D. Prevent mixing of refuse or chemically injurious materials or liquids.

4. MAINTENANCE OF STORAGE

   A. Periodically inspect stored products on a scheduled basis.

   B. Verify that storage facilities comply with manufacturer's product storage requirements.

   C. Verify that manufacturer required environmental conditions are maintained continually.

   D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of contract documents.

END OF SECTION

SECTION 017000
PROJECT CLOSE OUT

1. RELATED DOCUMENTS

   A. All provisions of the Contract Documents apply to this section. The Contractor(s) shall be responsible for complete familiarity with same.

2. SCOPE

   A. Each Contractor shall furnish guarantees, warranties, bonds and release of liens to the Architect, as required under various sections of the Specifications.

   B. Each Contractor shall submit one (1) set of blue line drawings indicating on this set of Drawings, "Record Drawing" conditions in red. Further, indicated by letter, all "Record Drawing" conditions different from the Specifications specified. These Drawings and letters shall be submitted to the Architect.

3. FINAL INSPECTION AND ACCEPTANCE

   A. When the Contractor is satisfied that all work required by plans and specifications for his division of the contract has been completed, he shall prepare his own punch list and complete it. After he has completed his own punch list, he shall notify the Architect in writing.

   B. Upon acceptance of this notification, the Architect and Contractor's Representative will conduct a punch list inspection to determine what items remain in an unacceptable condition. A report of this inspection will be delivered to the Contractor as soon as possible following acceptance of the Contractor's letter of completion.

   C. Upon receipt of the list of deficiencies, which shall include a schedule for completion of the items, the Contractor shall take immediate corrective action of all items.

   D. The Contractor shall notify the Architect and the Owner, in writing, a minimum of five (5) days prior to the date of Final Inspection.

   E. If such inspection proves to be completely satisfactory to the Owner, the construction period shall terminate on date of such Final Inspection, and a certificate of substantial completion shall be completed by the Architect and submitted to the Owner and Contractor for execution.

4. CLEANING UP

   A. Contractor shall daily clean up all refuse, rubbish, scrap materials and debris caused by his operations to the end that at all times the site shall present a neat, orderly and workmanlike appearance. Crates and cartons in which materials, equipment, or fixtures are received shall be removed daily.

   B. If, in the opinion of the Architect, neatness is not maintained, the Architect may have the area cleaned, and charge the costs to the responsible Contractor. The Architect may pro-rate the cost of clean-up to all Division Contractors if responsibility is not clear, and the Owner may withhold such charges from amounts owing to Subcontractors and pay the same directly to the persons doing such work.

   C. At the completion of the building, the General Contractor, in addition to removal of accumulated rubbish, shall remove stain spots and marks from all exposed surfaces of existing and new construction.

D. All contractors, at the completion of their branch of work, shall remove all surplus material, false work, temporary structures, including foundations thereof, plants of any description and debris of every nature resulting from the operations and put the site in a neat and orderly condition.

5. RELEASE OF LIENS

A. The lien laws of the State of Ohio shall govern all work and materials.

B. The Contractor shall furnish the Owner with each estimate for payment and before final payment is made, a full Release of Lien signed by all Subcontractors and Materialmen associated in any way with the work.

C. If any Subcontractor refuses to furnish a Release or receipt in full, the Contractor may furnish a bond satisfactory to the Owner to Indemnify the Owner against any lien.

D. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all the monies that the latter may have been compelled to pay in discharging such lien including all costs and a reasonable attorney's fee.

6. RECORD DRAWINGS

A. Each Contractor shall keep an accurate record of all deviations from Contract Documents and shall neatly and correctly enter in colored pencil any deviations on drawings affected and shall keep drawings available for inspection. A separate set of drawings will be maintained for each separate Contract.

B. At completion of job and before final approval, Contractor shall make final corrections to drawings and certify to the accuracy of each print by signature thereon and deliver same to the Architect.

END OF SECTION

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions and 007300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - 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.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. 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.
   3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 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.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. 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.

C. 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:

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. 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.

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. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide control diagrams by controls manufacturer as installed.

I. Include test and balancing reports.

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. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Electronic Format: In addition to physical binders and drawings, provide electronic Operation and Maintenance manuals in PDF format. Include bookmarks for each chapter by CSI division. Within each CSI division include a bookmark for each item.

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.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration and training of products, equipment and systems including but not limited to the following:
   1. Finishes - Maintenance and care.
   2. Athletic equipment - Operation and maintenance.
   3. Mechanical Equipment - Operation, maintenance and programing.

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.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Finishes, including flooring, wall finishes, ceiling finishes.
   2. Fixtures and fittings.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Training Plan: 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 not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. 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. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.03 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 Provider 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 Provider.

E. Provide training in minimum two hour segments.

F. The Commissioning Provider 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

SUBSTITUTION REQUEST FORM

To: LEVIN PORTER ASSOCIATES INC
3011 Newmark Drive
Miamisburg, OH 45432

Project: Bradford EVSD – New Athletic Facility
Bradford Board of Education
760 Railroad Avenue, Bradford, OH 45308

LPA Project No.: Date Received:_____

Specification Section Number and paragraph:_____

Drawing and details affected:_____

Proposed Substitution:_____

Manufacturer:_____

Product (model, pattern, etc.):_____

WHY IS SUBSTITUTION BEING SUBMITTED? (Select 1 of the following):

☐ Pre-Bid Substitution (Prior Approval) Bid Date:
☐ Specified product is not available. Explain.
☐ Cost savings to Owner. Indicate comparative cost analysis.
☐ Other. Explain.

_____

_____

_____

_____

_____

EFFECTS OF PROPOSED SUBSTITUTION Answer the following questions and attach explanations.

Does substitution affect dimensions indicated on Drawings?
(NO) (YES, explain)

Does substitution affect Work of other Sections?
(NO) (YES, explain)

Does substitution require modifications to design, changes to Drawings, or revisions to specifications to be incorporated into the Project?
(NO) (YES, explain)

CONTRACTOR'S / BIDDER'S REPRESENTATION
Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitution into the Project per Section 01340.

SUBMITTED BY:

_____

_____

_____

For Architect's Use:
Accepted ☐ Not Accepted ☐
No Action Required ☐
Submission: Incomplete ☐ Too Late ☐
Reviewed by/date: _____
Comments: _____

Subcontractor's signature and date: _____

Contractor's signature and date: _____

_____

023000 – EXISTING CONDITIONS

SOILS REPORT

Refer to the soils report as attached.

SOIL STUDY FOR PROPOSED BUILDING AND TRACK, BRADFORD HIGH SCHOOL RAILROAD AVENUE, BRADFORD, OHIO

Submitted For:

Bradford Exempted Village School District Board of Education
c/o WDC Group LLC
Attn: Mr. Jason Funderburg
23 South Center Street
Springfield, Ohio 45502

Report No. 204814-0522-088

May 11, 2022

BOWSER MORNER®

4518 Taylorsville Road—Dayton, Ohio 45424—937.236.8805
www.bowser-morner.com

BOWSER MORNER

DAYTON ENGINEERING SERVICES
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Dayton, Ohio 45401-0051
P. 937.236.8805 F. 937.233.2016
www.bowser-morner.com

May 11, 2022

Bradford Exempted Village School District Board of Education
c/o WDC Group LLC
23 South Center Street
Springfield, Ohio 45502

Attention: Mr. Jason Funderburg,
Project Manager

Re: Report No. 204814-0522-088; Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio

Dear Mr. Funderburg:

Bowser-Morner, Inc. is pleased to submit our report of the soil study for the above-referenced project. The purpose of this study is to determine the physical characteristics of the soil strata and allowable bearing capacity for the proposed building and bleachers. Also noted are other conditions that could affect the design and/or construction of the structures and track.

The samples collected that were not used to perform the laboratory tests will be kept in our laboratory for 30 days unless you advise us otherwise. If you have any questions or if we can help you in any way on this project or future work, please call us.

Sincerely,
BOWSER-MORNER, INC.

"This document was originally issued by Chris R. Ryan, M.S.C.E., P.E. and Daniel Otieno on May 11, 2022. This document is not considered a sealed document."

Daniel M. Otieno
Geotechnical Engineer

Chris R. Ryan, M.S.C.E., P.E.
Sr. Geotechnical Engineer

DO/CRR/an
3-Client
2-File

TABLE OF CONTENTS

SECTION **PAGE NO.**

I TEXT

1.0 INTRODUCTION 1

2.0 WORK PERFORMED 1

2.1 FIELD WORK 1

2.2 LABORATORY WORK 1

3.0 SOIL AND GROUNDWATER CONDITIONS 2

4.0 DISCUSSION AND RECOMMENDATIONS 3

4.1 PROJECT DESCRIPTION 3

4.2 FOUNDATION RECOMMENDATIONS 4

4.3 FLOOR SLABS ON-GRADE 6

4.4 COMPACTION REQUIREMENTS 7

4.5 FOUNDATION EXCAVATIONS 7

4.6 CONSTRUCTION DEWATERING 8

4.7 DRAINAGE 9

4.8 TRACK RECOMMENDATIONS 9

5.0 CLOSURE 10

5.1 BASIS OF RECOMMENDATIONS 10

5.2 LIMITATIONS AND ADDITIONAL SERVICES 11

5.3 WARRANTY 12

II SUGGESTED SPECIFICATIONS

CLEARING AND GRADING

III BORING LOG TERMINOLOGY, BORING LOGS, LABORATORY DATA, AND PRINTS

Section I

Text

1.0 INTRODUCTION

Bradford Exempted Village School District Board of Education will construct a multipurpose building, bleachers, and an 8-lane all-weather track in the Bradford High School complex at 750 Railroad Avenue in Bradford, Ohio. A vicinity map (Figure 1) is included in Section III of this report. Our findings on the soil conditions and groundwater levels with respect to the potential construction problems, and recommendations for the allowable bearing capacity for the construction of the building and track are given in this report.

Authorization to proceed with this soil study was given by Bradford Exempted Village School District Board of Education in Purchase Order dated March 29 2022. The work was to proceed in accordance with our proposal and agreement, Quotation No. 22-2771-024 dated March 9, 2022.

The draft soil boring logs and preliminary foundation recommendations were emailed to Mr. Jason Funderburg, project manager of WDC Group LLC., on April 19, 2022.

2.0 WORK PERFORMED

2.1 Field Work

Six soil borings were made at the locations shown on the boring location plan, Figure 2 in Section III. Borings 1 and 2 were performed in the proposed building site, Borings 3 and 4 were performed in the proposed bleacher sites, and Borings 3 through 6 were performed in the proposed track site. The boring logs and boring location plan are included in Section III. The borings were made with an ATV boring rig using hollow-stem augers and standard penetration resistance methods. The standard penetration tests were performed in accordance with ASTM D1586, which includes a 140-pound hammer, 30-inch drops, and two-inch-O.D. split-spoon samplers driven at maximum depth intervals of five feet or at major changes in stratum, whichever occurred first. The disturbed split-spoon samples were visually classified, logged, sealed in moisture-proof jars, and taken to the Bowser-Morner, Inc. laboratory for study. The depths where these "SS"-type split-spoon samples were collected are noted on the corresponding boring logs.

2.2 Laboratory Work

Two (2) Atterberg limits tests were performed in accordance with ASTM D4318 to determine the liquid and plastic limits on the most visibly plastic cohesive soil or as needed for soil classification. In addition, 21 moisture content determinations were made in accordance with ASTM D2216. The moisture contents ranged from 11.2% to 25.1% for the brown or gray silty clay or silty clay with sand. The moisture content was 7.3% for the brown and gray sandy silt, and 26.8% for the brown lean clay. The results of the laboratory tests are summarized in Table 2-1 and included in Section III of this report.

Table 2-1. Summary of Laboratory Test Results

Boring No.	Depth (ft.)	Moisture Content (%)	Atterberg Limits LL	PL	PI
1	1.0 – 2.5	21.4			
	3.5 – 5.0	17.9			
	6.0 – 7.5	13.0			
	8.5 – 10.0	12.5			
2	6.0 – 7.5	14.6			
	8.5 – 10.0	13.3			
	13.5 – 15.0	14.1			
	18.5 – 20.0	7.3			
3	1.0 – 2.5	18.5			
	6.0 – 7.5	14.5	22	15	7
	13.5 – 15.0	12.2			
	18.5 – 20.0	11.0			
4	3.5 – 5.0	26.8			
	6.0 – 7.5	17.7			
	8.5 – 10.0	19.7			
	13.5 – 15.0	12.7			
5	1.0 – 2.5	19.5			
	3.5 – 5.0	13.5			
	6.0 – 7.5	13.9			
6	1.0 – 2.5	20.6	42	19	23
	3.5 – 5.0	25.1			

3.0 SOIL AND GROUNDWATER CONDITIONS

Based on the information from the six borings made for this study, the subgrade soil conditions are described in descending order below:

- Six to 18 inches of topsoil.
- In Boring 4 and below the topsoil layer, five feet of medium stiff-to-brown lean clay.
- In Borings 1, 2, 3, 5 and 6 and below the topsoil layer, and in Borings 4 and below the brown lean clay layer, 9.3 to 19 feet of soft-to-hard brown or gray silty clay or silty clay with sand. The layer extends to the bottom of the boring at a depth of 19.5, 20, 10, and 10 feet below the existing grade in Borings 3, 4, 5, and 6 respectively.
- In Boring 1 and below the brown silty clay with sand, five feet of medium stiff brown silty sand with gravel. Below the brown silty sand with gravel layer, three feet of hard brown and gray silty clay extending to the bottom of the boring at a depth of 20 feet below the existing grade.

- In Boring 2 and below the brown silty clay with sand layer, 3.3 feet of medium stiff brown sandy clay. Below the brown sandy clay layer, two feet of hard, brown and gray sandy silt extending to the bottom of the boring at a depth of 20 feet below the existing grade.

Free groundwater was encountered during the advancement of the borings at the depths and elevations summarized in Table 3-1.

Table 3-1. Summary of Groundwater Observations

Boring No.	Depth Groundwater First Observed (ft)		Groundwater Observations at Completion of Boring	
	Depth	Elevation*	Depth	Elevation*
1	4.5	96.1	7.0	93.6
2	14.7	87.7	No Water	
3	7.0	96.2	16.0	87.2
4	5.5	98.9	No Water	
5	No Water		No Water	
6	No Water		No Water	

*Refers to an assumed elevation of 100.0 feet for the benchmark shown on the boring location plan.

Free groundwater is defined as water that seeps into an open borehole before it is backfilled. Groundwater observations were made during the boring operations by noting the depth of water on the boring tools and in the open boreholes following withdrawal of the boring augers. However, it should be noted that short-term water level readings are not necessarily a reliable indication of the groundwater level and that significant fluctuations may occur due to variations in rainfall and other factors. For specific questions on the soil conditions, please refer to the individual boring logs in Section III.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Project Description

Bradford Exempted Village School District Board of Education will construct a multipurpose building, bleachers, and an 8-lane all-weather track in the Bradford High School complex at 750 Railroad Avenue in Bradford, Ohio. The proposed building will be approximately 10,000 to 12,000 square feet. No specific design and loading information was given for this report.

The following recommendations are based on this information. If the above statements are incorrect or changes are made, Bowser-Morner, Inc. should be notified so that the new data can be reviewed and additional recommendations and services can be given if required to meet the needs of your project.

4.2 Foundation Recommendations

4.2.1 Building and Bleachers

Based on the information from Borings 1 and 2 performed on the proposed building site, and Borings 3 and 4 performed in the proposed bleacher sites, the areas are covered with topsoil and weak soil that extends to the approximate depths and elevations outlined in Table 4-1.

Table 4-1. Depths to Bottoms of Unreliable Soil Laye

Boring No.	Depth to Bottom of Unreliable Soil (ft)	Elevation* at Bottom of Unreliable Soil (ft)	Topsoil, Fill, and/or Weak Soil	Allowable Bearing Capacity (psf)
Building				
1	0.5	100.1	Topsoil	1,000
	6.0	94.6	Topsoil and Weak Soil	2,000
2	1.5	100.9	Topsoil	2,500
Bleachers				
3	0.5	102.7	Topsoil	2,000
4	0.5	103.9	Topsoil	1,000**

*Refers to an assumed elevation of 100.0 feet for the finished floor shown on the boring location plan.

**Bearing capacity applies only to foundations placed at the depths specified in Table 4-1. The recommended allowable bearing capacities will have to be reduced with foundations to be placed below a depth of 5.0 feet, because weaker soil layers were encountered at a depth of 8.5 feet in Boring 4.

The topsoil is unreliable to support the building and bleacher foundations, and floor slab on-grade. Within the building and bleacher construction limits, the topsoil and the weak soil can be removed to the suitable depths with the desired allowable bearing capacities as outlined in Table 4-1 and replaced with compacted backfill. The topsoil can be stockpiled for landscaping purposes.

The bottoms of the foundation excavations should extend to the suitable depths with the desired allowable bearing capacities as outlined in Table 4-1. After the foundation excavations extend to the suitable depths, the over-excavation can be filled with compacted backfill. The bottoms of the foundations for the bleachers should be placed at least 36 inches below the final adjacent grades to protect against frost penetration and heaving. Additionally, the bottoms of exterior foundations for the building should be placed at least 32 inches below the final adjacent grades to protect against frost penetration and heaving, if building will be heated. Interior footings not subject to frost action may bear at a minimum depth of 18 inches below the floor slab if they are supported on original materials or compacted fill placed in accordance with our recommendations.

The base of each excavation should extend one lateral foot for every foot of excavation below the bottom of the foundation as shown in Figure 3 in Section III. If an excavation will extend more than five feet below the existing grade, a maximum allowable side slope of 1 (horizontal) to 1 (vertical) should be maintained in any excavation for stability and for the safety of the workers.

After the foundation excavations extend to the desired grade, the top foot at the bottom of each excavation should be compacted to at least 90% of the maximum dry-unit weight as determined by the modified Proctor test (ASTM D1557) before any new fill or foundation is placed. Any soft soil pockets should be undercut and replaced with newly compacted fill. Any lean clay soils to be imported as backfill or removed from the project site probably will have significantly different Proctor values. Consequently, samples to be tested by the Proctor method should be obtained from a representative area and from the same elevation as the design subgrade.

After the bottoms of the excavations have been compacted, structural fill can be placed to bring the bottoms of the excavations to reach the desired final grade. The fill placed below the bottom of the foundations should be placed in eight-inch-thick lifts and compacted to at least 95% of the maximum dry-unit weight as determined by the modified Proctor test (ASTM D1557). Fill placed above the bottom of the foundations to serve as the subgrade for the floor slab should be compacted to at least 90% of the maximum dry-unit weight as determined by the modified Proctor test (ASTM D1557). Structural fill should be placed in accordance with the recommendations given in Section 4.4.

The foundations for the building or bleachers can be supported on the original subgrade soil or newly compacted backfill extending to the depths and elevations outlined in Table 4-1. The foundations can be designed with the corresponding net allowable bearing capacities outlined in Table 4-1. For these recommended allowable bearing capacities outlined in Table 4-1 for the original soil layer or for the newly compacted backfill, the total estimated amount of settlement of the foundations will be about one inch.

The soil removed from this site that is free of organic or objectionable materials as defined by a field technician who is qualified in soil material identification and compaction procedures can be reused as fill. Objectionable or undesirable soils are defined as those materials that cannot meet design placement specifications or materials that will deteriorate with time.

When determining the geometric size (the “footprint”) of the foundation, the total system loads applied to the tops of the foundations should be considered in the bearing pressure calculations.

The bearing capacities recommended in Table 4-1 for foundations supported on structural fill applies to well-graded granular soils, low-to-medium plastic clays, clayey sands, and some silty sands that are placed and compacted in accordance with the recommendations given in this report. However, uniformly graded or gap-graded granular soils (GP or SP), silts (ML), silty fine sands (SM), and high plasticity clays (CH) will be difficult to place and compact, and may result in a reduced bearing capacity. If these soils will be used as backfill, Bowser-Morner should be notified before the soils are placed so that the proposed placement methods and bearing capacity recommendations can be reviewed.

The bearing capacity of a soil is not a unique physical property of the soil. Instead, it depends explicitly on several factors including the footing type, size, and shape; the depth of embedment; the eccentricity and inclination of the applied load; the footing base inclination; the stiffness of the footing; the proximity of the footing to open cuts or slopes; the relative distance between the bottom of the footing and the water table; and the allowable amounts of settlement. The recommended allowable bearing capacity is based on the foundation design parameters given above and the assumptions that the applied load is vertical with no eccentricity, the base is horizontal and level, the footing is rigid, the footing is not close to an open cut or slope, and the water table is below the bottom of footing. If the actual conditions vary from the parameters and assumptions stated above, Bowser-Morner should be notified so that the new information can be reviewed and additional recommendations and services can be given to meet the needs of your project.

Foundations supported on soil settle as the result of externally applied loads. While the foundations should be expected to settle, the amount of settlement should be within the tolerable limits for the structure.

4.2.2 Site Classification For Seismic Design

Based on the results of the standard penetration tests (SPT) in the borings made for this study, the average "N" values range from 7 to 29 blows per foot for the soil layer within 10 to 20 feet of the existing grade. Based on the results of the average "N" value, it is our opinion that the site will be classified as an "E" type in accordance with the *Ohio Building Code*. However, if the weak soil is removed and replaced with compacted backfill, then the site can be reclassified as a "D" type in accordance with the *Ohio Building Code*.

4.3 Floor Slabs On-Grade

The topsoil is also not reliable to support the building floor slab on-grade due to the potential for settlement. The bottoms of the floor slab on-grade excavations should extend to the suitable depths with the desired allowable bearing capacities as outlined in Table 4-1. The building floor slab on-grade either can be constructed over the newly compacted backfill. The upper one foot of compacted fill should be a well-graded, granular material such as crushed sand and gravel or crushed stone. To help distribute concentrated loads and equalize moisture conditions under the slab, this granular material should contain less than 5% of fines or particles that can pass through a No. 200 sieve.

We also recommend that slab "float" by being fully supported on the ground and not structurally connected to the foundations. Floating will minimize the possibility of cracking and displacement of the slabs as a result of differential movements between the slabs and the foundations. Although the movements should be within the tolerable limits for structural safety, such movements could be detrimental to the slabs if they were rigidly connected to the foundations.

4.4 Compaction Requirements

Structural fill placed below the foundation bearing elevation should be compacted to at least 95% of the maximum dry unit weight with moisture contents within 2% of the optimum moisture content as determined by the modified Proctor test (ASTM D1557). Fill placed above the bottoms of the foundations or under pavement areas should be compacted to at least 90% of the maximum dry unit weight with moisture contents within 2% of the optimum moisture content as determined by the modified Proctor test (ASTM D1557). The compaction should be accomplished by placing the fill in successive, horizontal, approximately six- to eight-inch-thick loose lifts and mechanically compacting each lift to at least the specified minimum dry density. Field density tests should be performed at a minimum rate of one per 2,500 square feet of fill area and for each lift to verify that adequate compaction is achieved. Backfill for utility trenches, foundation excavations, etc., within structures or paved areas, is considered structural fill and should be placed in accordance with these recommendations.

It must be emphasized that the excavation and compaction of soil fill are highly influenced by weather conditions. Performing the earthwork under wet and frozen conditions is generally very difficult. As a result, compaction of wet silty and clayey soil should be avoided during wet and frozen conditions because the wet soil cannot be compacted to the required unit weight without drying or other soil stabilization methods. Alternatively, granular soil can be used as backfill to facilitate the backfill and compaction work during winter and wet weather conditions.

Puddling or jetting of the backfill material, including the utility trenches, should not be allowed as a compaction method. Silty or clayey soils encountered above foundation depth will often soften, and the bearing capacity may be reduced if water ponds in the excavation.

Lean concrete that is placed below the bottom of foundation should have a minimum 28-day compressive strength of 2,000 pounds per square inch (psi).

4.5 Foundation Excavations

During the foundation excavations, the subsurface conditions should be verified. Changes in subsurface conditions other than what are shown on the boring logs warrant additional subsurface investigation before the building or bleacher foundations are constructed.

The foundation excavations should be observed to ensure that the loose, soft, or otherwise undesirable materials are removed and that the foundations will be supported directly on an acceptable surface. At the time of this observation, it may be necessary to use a hand penetration device in the base of the foundation excavation to ensure that the soils immediately below the foundation base are satisfactorily prepared to support the foundations. Please note that such shallow observations do not replace an adequate deep-boring program and structural fill compaction QA/QC records. The overall performance of the foundations is governed by the soils below the bottom of the foundation.

If pockets of soft, loose, or otherwise unsuitable materials are encountered in the footing excavations and it is inconvenient to lower the footings, the proposed footing elevations may be reestablished by backfilling after the undesirable materials have been removed. The excavation under each footing should extend to suitable soils, and the base of the excavation should extend one lateral foot for every foot of excavation below the bottom of the foundation as shown in Figure 3 in Section III. The entire excavation should then be refilled with well-compacted, engineered fill. Special care should be taken to remove the sloughed, loose, or soft materials near the base of the excavation slopes. Extra care should also be taken to tie-in the compacted fill with the excavation slopes, with benches as necessary, to ensure that no pockets of loose or soft materials are left along the excavation slopes below the foundation bearing level. The contractor should maintain temporary cut slopes in accordance with the current OSHA regulations governing trenching and slope stability.

Soils exposed at the bases of satisfactory foundation excavations should be protected against any detrimental change in condition such as from construction disturbances, rain, and freezing. Surface runoff should be drained away from the excavation and not allowed to pond. If possible, foundation concrete should be placed the same day the excavation is made. If this is not practical, the foundation excavations should be adequately protected. Also, for this reason, proper drainage should be maintained after construction. It must be emphasized that all excavations must conform to all state, federal, and local regulations relative to slope geometry.

4.6 Construction Dewatering

At the time of our study, free groundwater was encountered in Borings 1 through 4 at depths of 4.5 to 16.0 feet below the existing grade as outlined in Table 3-1. Groundwater was not encountered in Borings 5 and 6 during the boring operations. Any groundwater and surface water infiltration encountered in the excavations should be lowered to the bottom of the excavation in silt and clay soils and should be lowered to at least three feet below the bottom of the maximum excavation in the sand and gravel layers using sumps and pumps. Sumps can consist of perforated pipes or drums installed vertically in the relatively permeable granular soils and surrounded with free-draining sand and gravel. The perforations of the pipe should be covered with a layer of filter fabric to keep silt and fine sand from pumping through the sumps. Care must be exercised when pumping from sumps that extend into silts or other granular soils since general deterioration of the bearing soils and a localized “quick” condition could result. The groundwater should be kept at a level below the fill operation during the placement and compaction of the backfill materials during the construction of the foundations.

The amount and type of dewatering required during construction will depend on the weather and groundwater levels at the time of construction, and the effectiveness of the contractor’s techniques in preventing surface runoff from entering open excavations. Typically, groundwater levels are highest during winter and spring, and lower in summer and early fall.

4.7 Drainage

Adequate drainage should be provided at the site to minimize any increase in moisture content of the foundation soils during and after construction. The exterior grade including all pavements or parking areas should be sloped away from the new building and bleacher foundations to keep water from ponding. All permanent foundation, wall, and below-grade floor drains should provide positive discharge away from the new structures.

4.8 Track Recommendations

4.8.1 Subgrade Preparation Recommendations

An 8-lane all-weather track will also be constructed at the site. Based on the information from Borings 3 through 6 performed in the proposed track site, the area is covered with topsoil that extends to the approximate depths and elevations outlined in Table 4-2.

Table 4-2. Depths to Bottoms of Unreliable Soil Layer

Boring No.	Depth to Bottom of Unreliable Soil (ft)	Elevation* at Bottom of Unreliable Soil (ft)	Topsoil, and/or Weak Soil
3	0.5	102.7	Topsoil
4	0.5	103.9	Topsoil
5	0.7	104.2	Topsoil
6	0.5	103.6	Topsoil

* Refers to an assumed elevation of 100.0 feet for the finished floor shown on the boring location plan.

The topsoil in the proposed 8-lane track area should be removed. The topsoil can be stockpiled for landscaping purposes. After the topsoil has been removed and any ground surface in the proposed track areas that is higher than the proposed subgrade has been re-graded, the top foot of the subgrade soil layer at the bottom of the excavation should be compacted to at least 90% of the maximum dry-unit weight as determined by the modified Proctor test (ASTM D1557) before any new fill or subgrade is placed. Any soft soil pockets should be undercut and replaced with newly compacted fill. Verification of the subgrade will have to be performed during the re-compaction of the top of the stripped ground surface. A soil technician under the supervision of the geotechnical engineer should be on-site to observe the compaction. Any additional backfill to be placed over the recompacted ground surface to support the granular base should be placed in eight-inch-thick lifts and compacted to at least 90% of the maximum dry-unit weight as determined by the modified Proctor test (ASTM D1557).

Any weak or loose soil layer encountered during the re-compaction of the subgrade soil layer should be undercut and replaced with newly compacted backfill. Any thin layer of soft clay can be scarified and recompacted to achieve the density to at least 90% of the maximum dry-unit weight as determined by the

modified Proctor test. The recompacted subgrade should be firm with the deflection less than 1/2 inches under the compaction equipment.

Any additional subgrade fill, which is needed to reach the final proposed subgrade, can be placed and compacted to bring the ground to the desired grade, if needed. The newly placed fill should be placed in horizontal eight-inch-thick lifts and compacted to at least 90% of the maximum dry-unit weight with moisture contents within 2% of the optimum moisture content by the modified Proctor method (ASTM D1557). The granular base and the running track can be supported on the newly compacted soil or on the recompacted subgrade.

Silty or clayey soil at subgrade depth will tend to degrade quickly under construction traffic when wet. Degradation of the wet subgrade soils will result in a reduced support value. For this reason, all of the exposed subgrade should be graded to drain and should be protected against any detrimental change in condition such as from disturbances, rain, and freezing. The ground surface should slope away from the track so that surface runoff is not allowed to pond next to it. Adequate drainage should be provided at the site to avoid an increase in moisture content of the subgrade soils during and after construction.

5.0 CLOSURE

5.1 Basis Of Recommendations

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions. Data used during this exploration included, but were not necessarily limited to:

- Six exploratory borings performed during this study.
- Observations of the project site by our staff.
- The results of the laboratory soil tests.
- The site plan provided by WDC Group LLC.
- Communications with Mr. Jason Funderburg, Project Manager of WDC Group LLC.
- Published soil or geologic data of this area.

In the event that changes in the project characteristics are planned, or if additional information or differences from the conditions anticipated in this report become apparent, Bowser-Morner, Inc. should be notified so that the conclusions and recommendations contained in this report can be reviewed and, if necessary, modified or verified in writing.

5.2 Limitations And Additional Services

The subsurface conditions discussed in this report and those shown on the boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by designers, or that the construction process has altered the soil conditions. As variations in the soil profile are encountered, additional subsurface sampling and testing may be necessary to provide data required to reevaluate the recommendations of this report. Consequently, after submission of this report, it is recommended that Bowser-Morner, Inc. be authorized to perform additional services to work with the designer(s) to minimize errors and omissions regarding the interpretation and implementation of this report.

Before construction begins, we recommend that Bowser-Morner, Inc.:

- Work with the designers to implement the recommended geotechnical design parameters into plans and specifications.
- Consult with the design team regarding interpretation of this report.
- Establish criteria for the construction observation and testing for the soil conditions encountered at this site.
- Review final plans and specifications pertaining to geotechnical aspects of design.

During construction, we recommend that Bowser-Morner, Inc.:

- Observe the construction, particularly the site preparation, fill placement, and foundation excavation.
- Perform in-place density testing of all compacted fill.
- Perform materials testing of soil and other materials as required.
- Consult with the design team to make design changes in the event that differing subsurface conditions are encountered.

If Bowser-Morner, Inc. is not retained for these services, we shall assume no responsibility for construction compliance with the design concepts, specifications or recommendations.

5.3 Warranty

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, express or implied, is made.

The scope of this study did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, within or beyond the site studied. Any statements in the report or on the boring logs regarding odors, staining of soils or other unusual items or conditions observed are strictly for the information of our client.

To evaluate the site for possible environmental liabilities, we recommend an environmental assessment, consisting of a detailed site reconnaissance, a record review, and report of findings. Additional subsurface drilling and sampling, including groundwater sampling, may be required. Bowser-Morner, Inc. can provide this service and would be pleased to provide a cost proposal to perform such a study, if requested.

This report has been prepared for the exclusive use of Bradford Exempted Village School District Board of Education c/o WDC Group LLC for specific application to the building and track on Railroad Avenue in Bradford, Ohio (see Figure 1 in Section III of this report). Specific design and construction recommendations have been provided in the various sections of the report. The report shall therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. Bowser-Morner, Inc. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

Section II

Specifications

CLEARING AND GRADING SPECIFICATIONS

I. GENERAL CONDITIONS

The contractor shall furnish all labor, materials, and equipment, and perform all work and services necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction and grading as shown on the plans and as described therein.

This work shall consist of all clearing and grading, removal of existing structures unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes, and specifications.

This work is to be accomplished under the constant and continuous supervision of the Owner or his designated representative.

In these specifications the terms "approved" and "as directed" shall refer to directions to the Contractor from the Owner or his designated representative.

II. SUBSURFACE CONDITIONS

Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work. Borings and/or soil investigations shall have been made. Results of these borings and studies will be made available by the Owner to the Contractor upon his request, but the Owner is not responsible for any interpretations or conclusions with respect thereto made by the Contractor on the basis of such information, and the Owner further has no responsibility for the accuracy of the borings and the soil investigations.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the Owner can investigate the condition.

III. SITE PREPARATION

Within the specified areas, all trees, brush, stumps, logs, tree roots, and structures scheduled for demolition shall be removed and disposed of.

All cut and fill areas shall be properly stripped. Topsoil will be removed to its full depth and stockpiled for use in finish grading. Any rubbish, organic and other objectionable soils, and other deleterious material, shall be disposed of off the site, or as directed by the Owner or his designated representative if on site disposal is provided. In no case shall such objectionable material be allowed in or under the fill unless specifically authorized in writing.

Prior to the addition of fill, the original ground shall be compacted to job specifications as outlined below. Special notice shall be given to the proposed fill area at this time. If wet spots, spongy conditions, or ground water seepage is found, corrective measures must be taken before the placement of fill.

IV. FORMATION OF FILL AREAS

Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross section. The depth of lift may be increased if the Contractor can demonstrate the ability to compact a larger lift. If compaction is accomplished using hand-tamping equipment, lifts will be limited to 4-inch lose lifts.

All material entering the fill shall be free of organic matter such as leaves, grass, roots, and other objectionable material.

The operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions. The Contractor shall keep the work areas graded to provide the drainage at all times.

The fill material shall be of the proper moisture content before compaction efforts are started. Wetting or drying of the material and manipulation to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. The moisture content of the fill material should be no more than two (2) percentage points higher or lower than optimum unless otherwise authorized. Sprinkling shall be done with equipment that will satisfactorily distribute the water over the disced area.

Compaction operations shall be continued until the fill is compacted to not less than 90% above foundation elevation and 95% below foundation elevation, of the maximum density as determined in accordance with the latest ASTM D-1557 (Modified). Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. If directed, original slopes shall be continuously, vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal and the back of the bench is vertical. As many benches as are necessary to bring the site to final grade shall be constructed. Filling operations shall begin on the lowest bench, with the fill being placed in horizontal eight (8) inch loose lifts unless otherwise authorized. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper

drainage shall be maintained at all times during benching and filling of the benches, to insure that all water is drained away from the fill area.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portion of the areas. Stones or fragmentary rock larger than four (4) inches in their greatest dimensions will not be allowed in the fill unless specifically authorized in writing. Rock fill shall be brought up in layers as specified or as directed, and every effort shall be exerted to fill the voids with the finer material to form a dense, compact mass. Rock or boulders shall be disposed of as deleterious material per Item III.

Frozen material shall not be placed in the fill nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all fills made under the contract, and shall replace any portion, which in the opinion of the Owner or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damaged by inclement weather shall be repaired at the Contractor's expense.

V. SLOPE RATIO AND STORM WATER RUN-OFF

Slopes shall not be greater than 2 (horizontal) to 1 (vertical) in both cut and fill, and storm water shall not be drained over the slopes.

VI. GRADING

The Contractor shall furnish, operate, and maintain such equipment as is necessary to construct uniform layers, and control smoothness of grade for maximum compaction and drainage.

VII. COMPACTING

The compaction equipment shall be approved equipment of such design, weight, and quantity to obtain the required density in accordance with these specifications.

VIII. TESTING AND INSPECTION SERVICES

Testing and inspection services will be provided by the Owner.

IX. SPECIAL CONDITIONS

Section III

Boring Log Terminology, Boring Logs, Laboratory Data, And Prints

BORING LOG TERMINOLOGY

Stratum Depth:

Distance in feet and/or inches below ground surface.

Stratum Elevation:

Elevation in feet below ground surface elevation.

Description of Materials:

Major types of soil material existing at boring location. Soil classification based on one of the following systems: Unified Soil Classification System., Ohio State Highway Classification System, Highway Research Board Classification System, Federal Aviation Authority Classification System, Visual Classification.

Sample No.:

Sample numbers are designated consecutively, increasing with depth for each boring.

Sample Type:

"A" Split spoon, 2" O.D., 1-3/8" I.D., 18" in length.

"B" Rock Core

"C" Shelby Tube 3" O.D. except where noted

"D" Soil Probe

"E" Auger Cuttings

"F" Sonic

Sample Depth:

Depth below top of ground at which appropriate sample was taken.

Blows per 6" on Sampler:

The number of blows required to drive a 2" O.D., 1-3/8" I.D., split spoon sampler, using a 140 pound hammer with a 30-inch free fall, is recorded for 6" drive increments. (Example: 3/8/9).

"N" Blows/Ft.:

Standard penetration resistance. This value is based on the total number of blows required for the last 12" of penetration. (Example: 3/8/9: N = 8 + 9 = 17)

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Water Observations:

Depth of water recorded in test boring is measured from top of ground to top of water level. Initial depth indicates water level during boring, completion depth indicates water level immediately after boring, and depth after "X" number hours indicates water level after letting water rise or fall over a time period. Water observations in pervious soil are considered reliable ground water levels for that date. Water observations in impervious soils can not be considered accurate ground water measurements for that date unless records are made over several days' time. Factors such as weather, soil porosity, etc., will cause the ground water level to fluctuate for both pervious and impervious soils.

SOIL DESCRIPTION

Color:

When the color of the soil is uniform throughout, the color recorded will be such as brown, gray, or black and may be modified by adjectives such as light and dark. If the soil's predominant color is shaded by a secondary color, the secondary color precedes the primary color, such as: gray-brown, yellow-brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled, such as: mottled brown and gray.

Particle Size		Visual
Boulders		Larger than 8"
Cobbles		8" to 3"
Gravel	– Coarse	3" to 3/4"
	– Fine	2 mm. To 3/4"
Sand	– Coarse	2 mm. – 0.6 mm. (Pencil lead size)
	– Medium	0.6 mm. – 0.2mm. Table sugar and salt size)
	– Fine	0.2 mm. – 0.06 mm. (Powdered sugar and human hair size)
Silt		0.06 mm. – 0.002 mm.
Clay		0.002 and smaller (Particle size of both Silt and Clay not visible To naked eye

Soil Components

Major Component:	Minor Component Term
Gravel	Trace 1-10%
Sand	Some 11-35%
Silt	And 36-50%
Clay	

Moisture Content

Term	Relative Moisture
Dry	Powdery
Damp	Moisture content below plastic limit
Moist	Moisture content above plastic limit but below liquid limit
Wet	Moisture content Above liquid limit

Condition of Soil Relative to Compactness Granular Material

Very Loose	5 blows/ft. or less
Loose	6 to 10 blows/ft.
Medium Dense	11 to 30 blows/ft.
Dense	30 to 50 blows/ft.
Very Dense	51 blows/ft. or more

Condition of Soil Relative to Consistency Cohesive Material

Very Soft	3 blows/ft. or less
Soft	4 to 5 blows/ft.
Medium Stiff	6 to 10 blows/ft.
Stiff	11 to 15 blows/ft.
Very stiff	16 to 30 blows/ft.
Hard	31 blows/ft. or more

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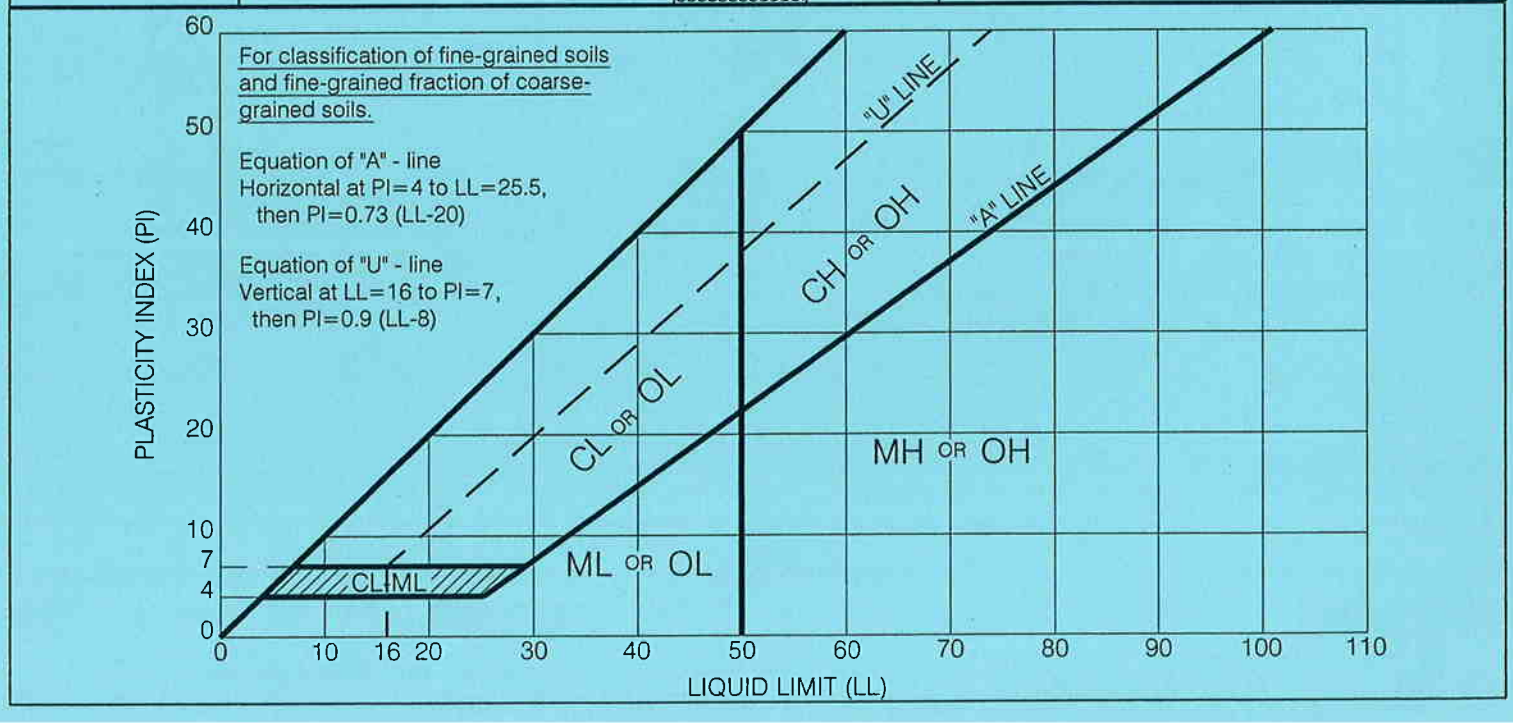
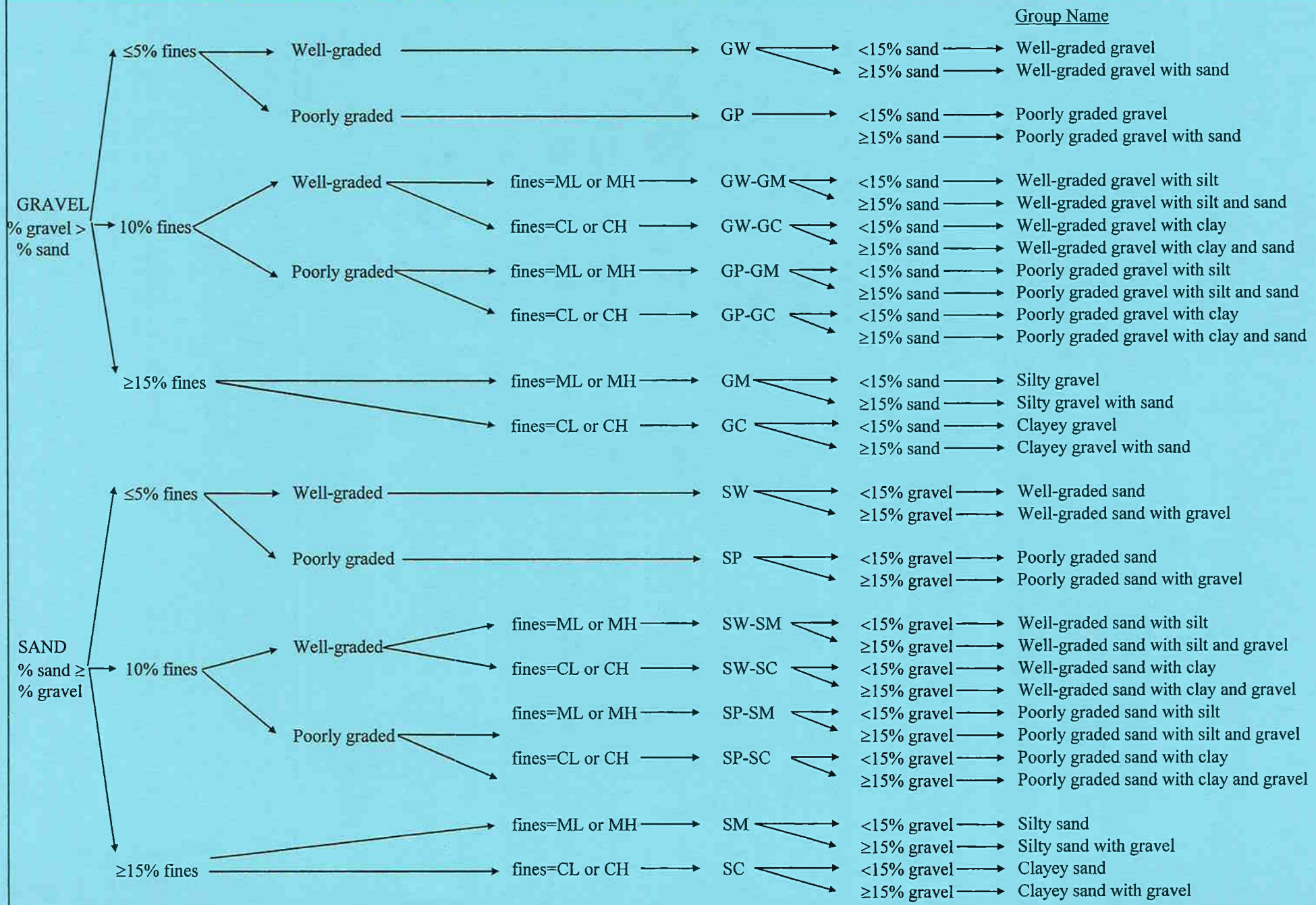
UNIFIED CLASSIFICATION SYSTEM

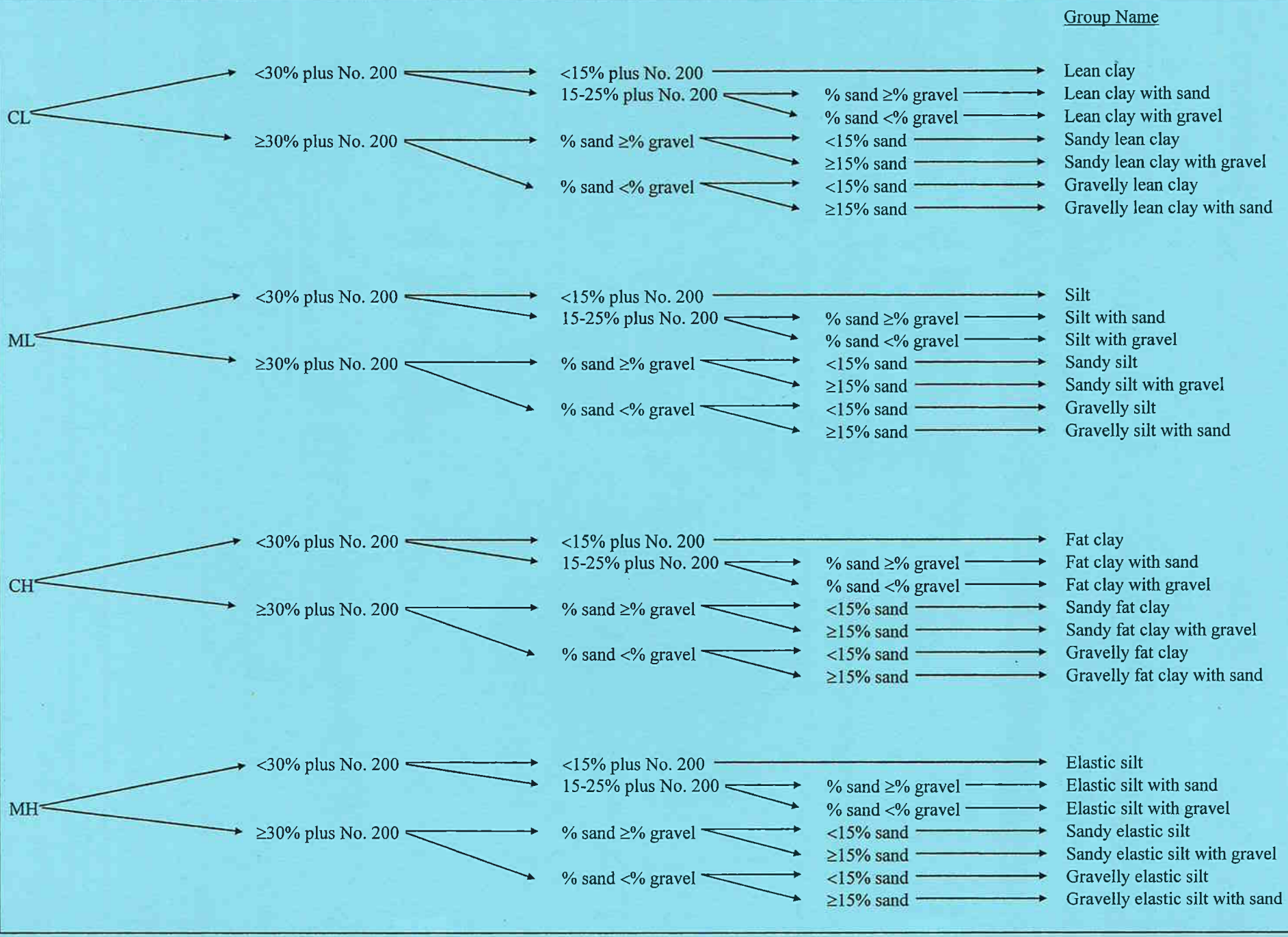
MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVEL WELL-GRADED GRAVEL WITH SAND
				GP	POORLY GRADED GRAVEL POORLY GRADED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



Flow Chart for Visually Identifying Soils Based on ASTM D-2488



Flow Chart for Visually Identifying Soils Based on ASTM D-2488



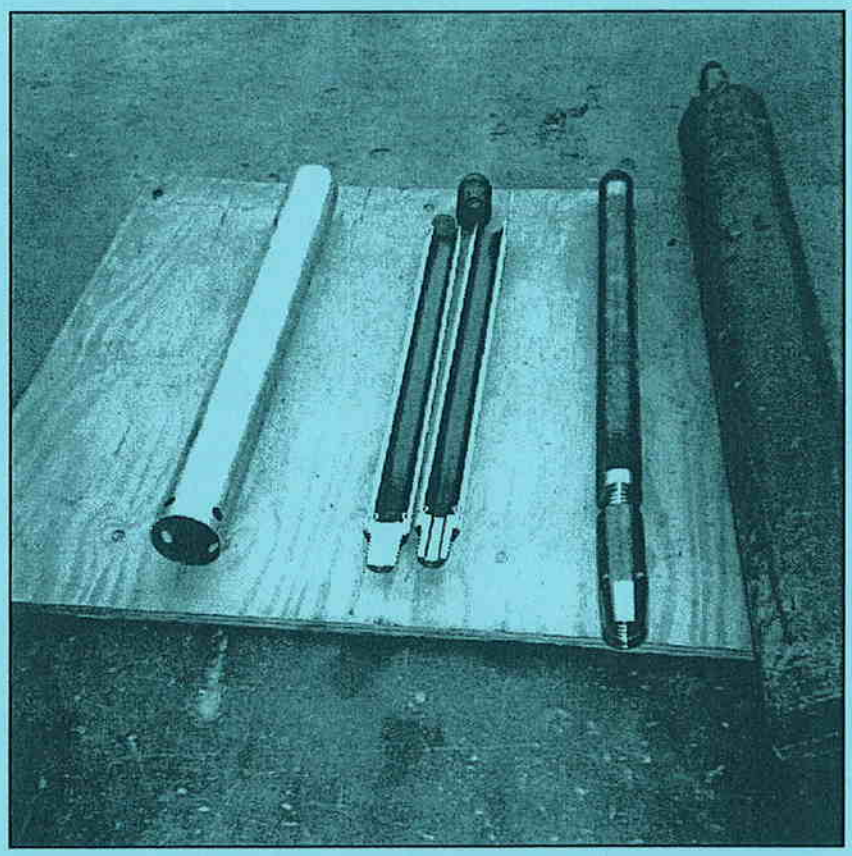
STANDARD PENETRATION RESISTANCE (ASTM D1586)

The purpose of this test is to determine the relative consistency of the soils in a boring, or from boring over the site. This method consists of making a hole in the ground and driving a 2-inch O.D. split spoon sampler into the soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven 18 inches and the number of blows recorded for each 6 inches of penetration. Values of standard penetration (N) are determined in blows per foot, summarizing the flows required for the last two 6-inche increments of penetration.

Example : 2-6-8; N = 14

THIN-WALLED SAMPLER (ASTM D1587)

The purpose of the thin-walled sampler is to recover a relatively undisturbed soil sample for laboratory tests. The sampler is a thin-walled seamless tube with a 3-inch outside diameter, which is hydraulically pressed into the ground, at a constant rate. The ends are then sealed to prevent soil moisture loss, and the tube is returned to the laboratory for tests.



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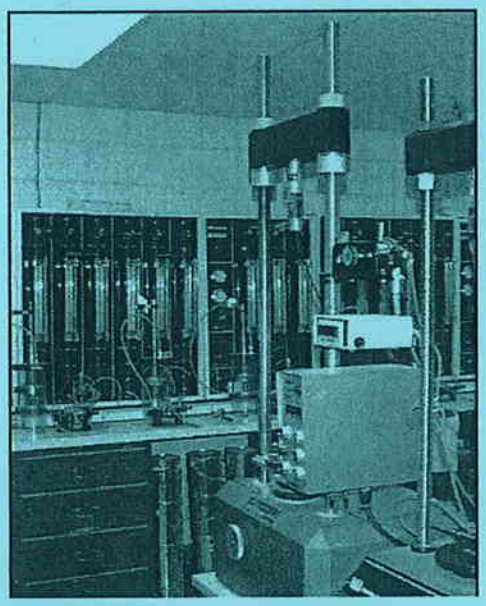
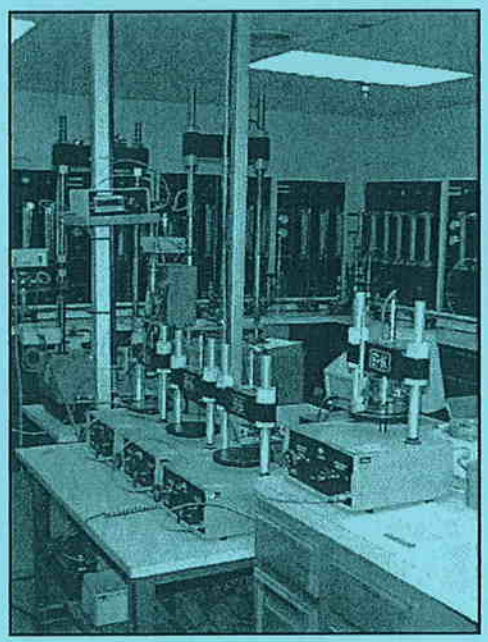
UNCONFINED COMPRESSION OR TRIAXIAL TESTS (ASTM D 2166)



The unconfined compression test and the triaxial tests are performed to determine the shearing strength of the soil, to use in establishing its safe bearing capacity. In order to perform the unconfined compression test, it is necessary that the soil exhibit sufficient cohesion to stand in an unsupported cylinder. These tests are normally performed on samples which are 6.0 inches in height and 2.85 inches in diameter. In the triaxial test, various lateral stresses can be applied to more closely simulate the actual field conditions. There are several different types of triaxial tests. These are, however, normally performed on constant strain apparatus with a deformation rate of 0.05 inches per minute.

CONSOLIDATION TEST (ASTM D 2435)



The purpose of this test is to determine the compressibility of the soil. This test is performed on a sample of soil which is 2.5 inches in diameter and 1.0 inch in height, and has been trimmed from relatively "undisturbed" samples. The test is performed with a lever system or an air activated piston for applying load. The loads are applied in increments and allowed to remain on the sample for a period of 24 hours. The consolidation of the sample under each individual load is measured and a curve of void ratio vs. Pressure is obtained. From the information obtained in this manner and the column loads of the structure, it is possible to calculate the settlement of each individual building column. This information, together with the shearing strength of the soil, is used to determine the safe bearing capacity for a particular structure.

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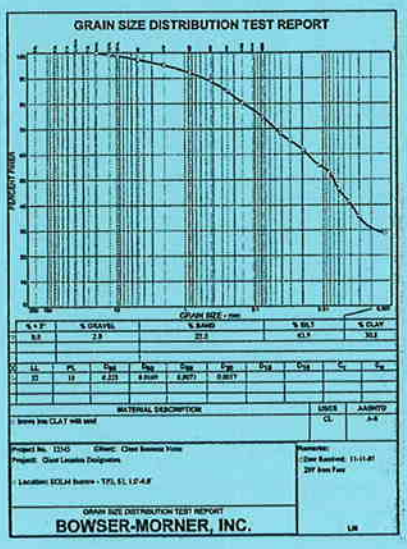
REVISED TO ASTM D4318
ATTERBERG LIMITS (ASTM D423 AND D424)

These tests determine the liquid and plastic limits of soils having a predominant percentage of fine particle (silt and clay) sizes. The liquid limit of a soil is the moisture content expressed as a percent at which the soil changes from a liquid to a plastic state, and the plastic limit is the moisture content at which the soil changes from a plastic to a semi-solid state. Their difference is defined as the plasticity index (P.I. = L.L. - P.L.), which is the change in moisture content required to change the soil from a "semi-solid" to a liquid. These tests furnish information about the soil properties which is important in determining their relative swelling potential and their classifications.

MECHANICAL ANALYSIS (ASTM D422)

This test determines the percent of each particle size of a soil. A sieve analysis is conducted on particle sizes greater than a No. 200 sieve (0.074 mm), and a hydrometer test on particles smaller than the No.200 sieve. The gradation curve is drawn through the points of cumulative percent of particle size, and plotted on semi-logarithmic paper for the combined sieve and hydrometer analysis. This test, together with the Atterberg Limits tests, is used to classify a soil.



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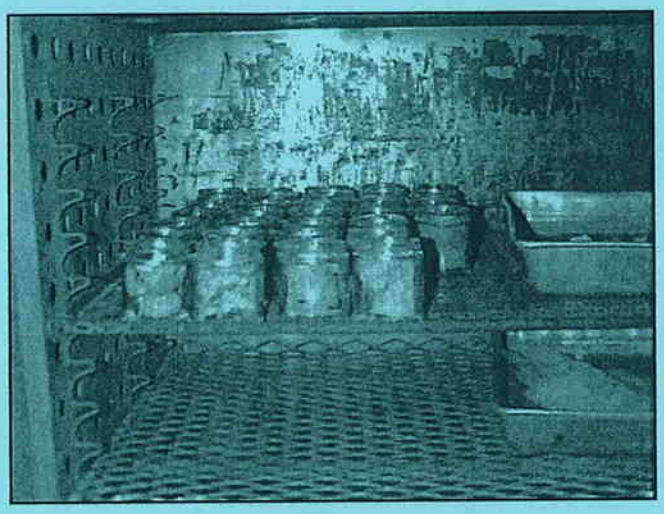
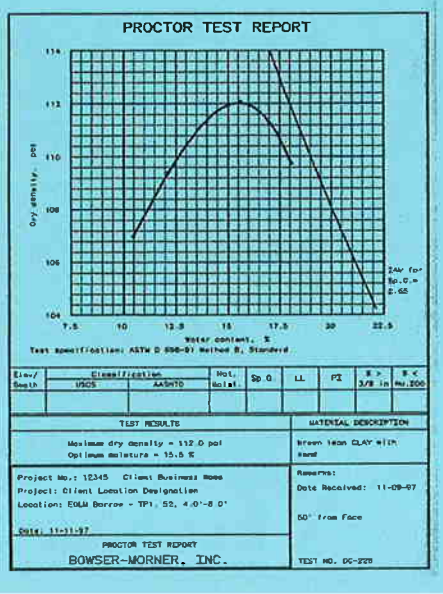
NATURAL MOISTURE CONTENT (ASTM D2216)

The purpose of this test is to indicate the range of moisture contents present in the soil. A wet sample is weighed, placed in the constant temperature oven at 105° for 24 hours, and re-weighed. The moisture content is the change in weight divided by the dry weight.



PROCTOR TESTS

The purpose of these tests is to determine the maximum density and optimum moisture content of a soil. The Modified Proctor test is performed in accordance with ASTM D1557. The test is performed by dropping a 10-pound hammer 25 times from an 18-inch height on each of 5 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 56,250 foot pounds per cubic foot. The moisture content is then raised, and this procedure is repeated. A moisture density curve is then plotted, with the density on the ordinate axis and the moisture on the abscissa axis. The moisture content at which the maximum density requirement can be achieved with a minimum compactive effort is designated as the optimum moisture content (O.M.C.). The Standard Proctor test is performed in accordance with ASTM D698. This test is similar to the Modified Proctor test and is performed by dropping a 5.5 pound hammer 25 times from a height of 12 inches on 3 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 12,375 foot pounds per cubic foot. This test gives proportionately lower results than the Modified Proctor test.


PROCTOR TEST REPORT

Dry density, pcf

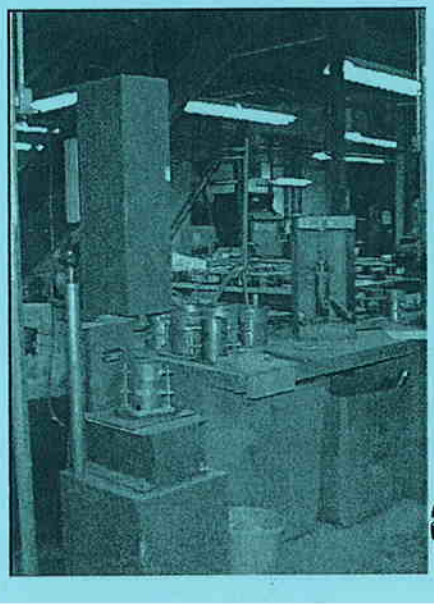
Water content, %

ZAV for Sp.G.= 2.65

Test specification: ASTM D 698-91 Method B, Standard

Elev./ Depth	Classification USCS	Classification AASHTO	Nat. Moist.	Sp. G.	LL	PI	% > 3/8 in	% < No.200

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.0 pcf Optimum moisture = 15.5 %	Brown lean CLAY with sand
Project No.: 12345 Client: Business Name Project: Client Location Designation Location: EQLN Borrow - TP1, S2, 4.0'-8.0' Date: 11-11-97	Remarks: Date Received: 11-09-97 50' from face
PROCTOR TEST REPORT BOWSER-MORNER, INC.	TEST NO. DC-228



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CLIENT
Bradford Exempted Village School District Board of Education c/o WDC Group LLC

PROJECT
Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio.

JOB NO. **204814**

BORING STARTED **4/7/22** | BORING COMPLETED **4/7/22**

DRILLER **cindrill** | METHOD **3 1/4" HSA**

TYPED BY **dmo**

1 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **40°09'29"N** LONG. **84°26'06"W**

SURFACE ELEVATION **100.6***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH (ft. BGL)	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (6")			
1.0	SS1			Stiff brown silty CLAY (trace gravel) - moist	4 4 7	◇ 11	
3.0				(Becomes soft at 3.5')	2 2 3	◇ 5	▽
6.0	SS3			Very stiff brown silty CLAY with sand (trace gravel) - moist	5 12 15	◇ 27	▼
8.0	SS4			(Becomes stiff at 8.5')	4 5 7	◇ 12	
12.0	SS5			Medium stiff brown silty SAND with gravel - wet	4 5 3	◇ 8	
17.0	SS6			Hard, brown and gray silty CLAY (trace sand, trace gravel) - moist	7 18 20	◇ 38	
20.0				Bottom of boring at 20.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH		DATE
INITIAL	4.5	▽	4/7/2022
AT COMPLETION	7.0	▼	4/7/2022
OTHER	N/A	▼	N/A

SS — SPLIT SPOON
SL — SPLIT SPOON W/SOIL LINER
NQ— ROCK CORE
ST — SHELBY TUBE
AS — AUGER CUTTINGS
SC — SONIC

GINT Report Used: NEWLOGIN Report No.: 204814.GPJ GINT Template Used: OH DOT.GDT Date Printed: 5/5/22

CLIENT
Bradford Exempted Village School District Board of Education c/o WDC Group LLC

PROJECT
Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio.

JOB NO. **204814**

BORING STARTED **4/7/22** | BORING COMPLETED **4/7/22**

DRILLER **cindrill** | METHOD **3 1/4" HSA**

TYPED BY **dmo**

2 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **40°09'29"N** LONG. **84°26'06"W**

SURFACE ELEVATION **102.4***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)

DEPTH (ft. BGL)	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE	REMARKS
0.0				TOPSOIL (18")	3		
2.0	SS1			Stiff, brown silty CLAY with sand (trace gravel) - moist	5 8	13	
4.0	SS2			(Becomes very stiff at 3.5')	6 7 9	16	
7.0	SS3				7 10 13	23	
9.0	SS4			(Becomes hard at 8.5')	8 13 18	31	
13.0				(Becomes gray at 12.5')			
14.0	SS5			(Becomes medium stiff at 13.5')	3 5 5	10	▽
15.0				Medium stiff brown sandy CLAY (some silt) - wet			
19.0	SS6			Hard, brown and gray sandy SILT (trace gravel) - moist	12 35 51	86	
20.0				Bottom of boring at 20.0 feet			

WATER LEVEL MEASUREMENTS

	DEPTH		DATE
INITIAL	14.7	▽	4/7/2022
AT COMPLETION	NONE	▼	4/7/2022
OTHER	N/A	▼	N/A

SS — SPLIT SPOON
SL — SPLIT SPOON W/SOIL LINER
NQ— ROCK CORE
ST — SHELBY TUBE
AS — AUGER CUTTINGS
SC — SONIC

GINT Report Used: NEWLOGIN Report No.: 204814.GPJ GINT Template Used: OH DOT.GDT Date Printed: 5/5/22

CLIENT
Bradford Exempted Village School District Board of Education c/o WDC Group LLC

PROJECT
Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio.

JOB NO. **204814**

BORING STARTED **4/7/22** | BORING COMPLETED **4/7/22**

DRILLER **cindrill** | METHOD **3 1/4" HSA**

TYPED BY **dmo**

3 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **40°09'29"N** LONG. **84°26'06"W**

SURFACE ELEVATION **103.2***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH (ft. BGL)	SAMPLE NO.	SAMPLER TYPE RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (6")			
1.0				Stiff brown silty CLAY - moist			
2.0	SS1				4 6 8	◇14	
3.0							
4.0	SS2			(Becomes medium stiff at 3.5')	2 4 5	◇9	
5.0							
6.0							
7.0	SS3				2 4 4	◇8	▽
8.0				(Becomes gray at 8.0')			
9.0	SS4			(Becomes stiff at 8.5')	5 6 8	◇14	
10.0							
11.0							
12.0							
13.0							
14.0	SS5			(Trace gravel at 13.5')	4 6 8	◇14	
15.0							
16.0							▼
17.0							
18.0							
19.0	SS6			(Trace sand, trace gravel. Beocomes hard at 18.5')	15 56	◇56	
20.0				Bottom of boring at 19.5 feet			
21.0							
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH		DATE
INITIAL	7.0	▽	4/7/2022
AT COMPLETION	16.0	▼	4/7/2022
OTHER	N/A	▼	N/A

SS — SPLIT SPOON
SL — SPLIT SPOON W/SOIL LINER
NQ— ROCK CORE
ST — SHELBY TUBE
AS — AUGER CUTTINGS
SC — SONIC

GINT Report Used: NEWLOGIN Report No.: 204814.GPJ GINT Template Used: OH DOT.GDT Date Printed: 5/5/22

CLIENT
Bradford Exempted Village School District Board of Education c/o WDC Group LLC

PROJECT
Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio.

JOB NO. **204814**

BORING STARTED **4/7/22** | BORING COMPLETED **4/7/22**

DRILLER **cindrill** | METHOD **3 1/4" HSA**

TYPED BY **dmo**

4 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **40°09'29"N** LONG. **84°26'06"W**

SURFACE ELEVATION **104.4***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH (ft. BGL)	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (6")			
1.0	SS1			Stiff brown lean CLAY (trace gravel, trace silt) - moist	4 5 6	◇11	
3.0				(Becomes medium stiff at 3.5')			
4.0	SS2				3 4 6	◇10	▽
6.0				Soft brown silty CLAY (trace gravel) - moist			
7.0	SS3				3 2 2	◇4	
9.0	SS4				2 2 1	◇3	
13.0							
14.0	SS5			Very stiff gray silty CLAY with sand (trace gravel) - moist	8 10 12	◇22	
19.0	SS6				6 9 11	◇20	
20.0				Bottom of boring at 20.0 feet			
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	5.5 ▽	4/7/2022
AT COMPLETION	NONE ▼	4/7/2022
OTHER	N/A ▼	N/A

SS — SPLIT SPOON
SL — SPLIT SPOON W/SOIL LINER
NQ— ROCK CORE
ST — SHELBY TUBE
AS — AUGER CUTTINGS
SC — SONIC

GINT Report Used: NEWLOGIN Report No.: 204814.GPJ GINT Template Used: OH DOT.GDT Date Printed: 5/5/22

CLIENT
Bradford Exempted Village School District Board of Education c/o WDC Group LLC

PROJECT
Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio.

JOB NO. **204814**

BORING STARTED **4/7/22** | BORING COMPLETED **4/7/22**

DRILLER **cindrill** | METHOD **3 1/4" HSA**

TYPED BY **dmo**

5 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **40°09'29"N** LONG. **84°26'06"W**

SURFACE ELEVATION **104.9***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH (ft. BGL)	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (8")			
1.0	SS1			Medium stiff brown silty CLAY with sand - moist	3 4 6	◇ 10	
2.0							
3.0							
4.0	SS2			(Becomes stiff at 3.5')	3 5 6	◇ 11	
5.0							
6.0	SS3				3 5 8	◇ 13	
7.0							
8.0							
9.0	SS4				4 5 6	◇ 11	
10.0				Bottom of boring at 10.0 feet			
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	NONE	4/7/2022
AT COMPLETION	NONE	4/7/2022
OTHER	N/A	N/A

SS — SPLIT SPOON
SL — SPLIT SPOON W/SOIL LINER
NQ— ROCK CORE
ST — SHELBY TUBE
AS — AUGER CUTTINGS
SC — SONIC

GINT Report Used: NEWLOGIN Report No.: 204814.GPJ GINT Template Used: OH DOT.GDT Date Printed: 5/5/22

CLIENT
Bradford Exempted Village School District Board of Education c/o WDC Group LLC

PROJECT
Soil Study for Proposed Building and Track, Bradford High School, Railroad Avenue, Bradford, Ohio.

JOB NO. **204814**

BORING STARTED **4/7/22** | BORING COMPLETED **4/7/22**

DRILLER **cindrill** | METHOD **3 1/4" HSA**

TYPED BY **dmo**

6 Boring No.

Sheet 1 of 1

PROJECT LOCATION
LAT. **40°09'29"N** LONG. **84°26'06"W**

SURFACE ELEVATION **104.1***

BORING LOCATION
As shown on Boring Location Plan.

It has been necessary to interpolate between samples. Therefore, the contacts between the various soil strata should not be taken as absolute.

COMMENTS
***Surface elevation refers to an assumed elevation of 100.0' for the benchmark shown on the Boring Location Plan.**

DEPTH (ft. BGL)	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				TOPSOIL (6")			
1.0 – 2.0	SS1			Medium stiff, brown silty CLAY (trace sand, trace gravel) - moist	3 4 5	◇9	
3.0 – 4.0	SS2				3 4 4	◇8	
5.0 – 6.0				Soft brown silty CLAY - moist	1 2 2	◇4	
7.0 – 8.0	SS3						
9.0	SS4			(Trace sand. Becomes medium stiff, brown and gray at 8.5')	2 4 5	◇9	
10.0				Bottom of boring at 10.0 feet			
11.0 – 22.0							

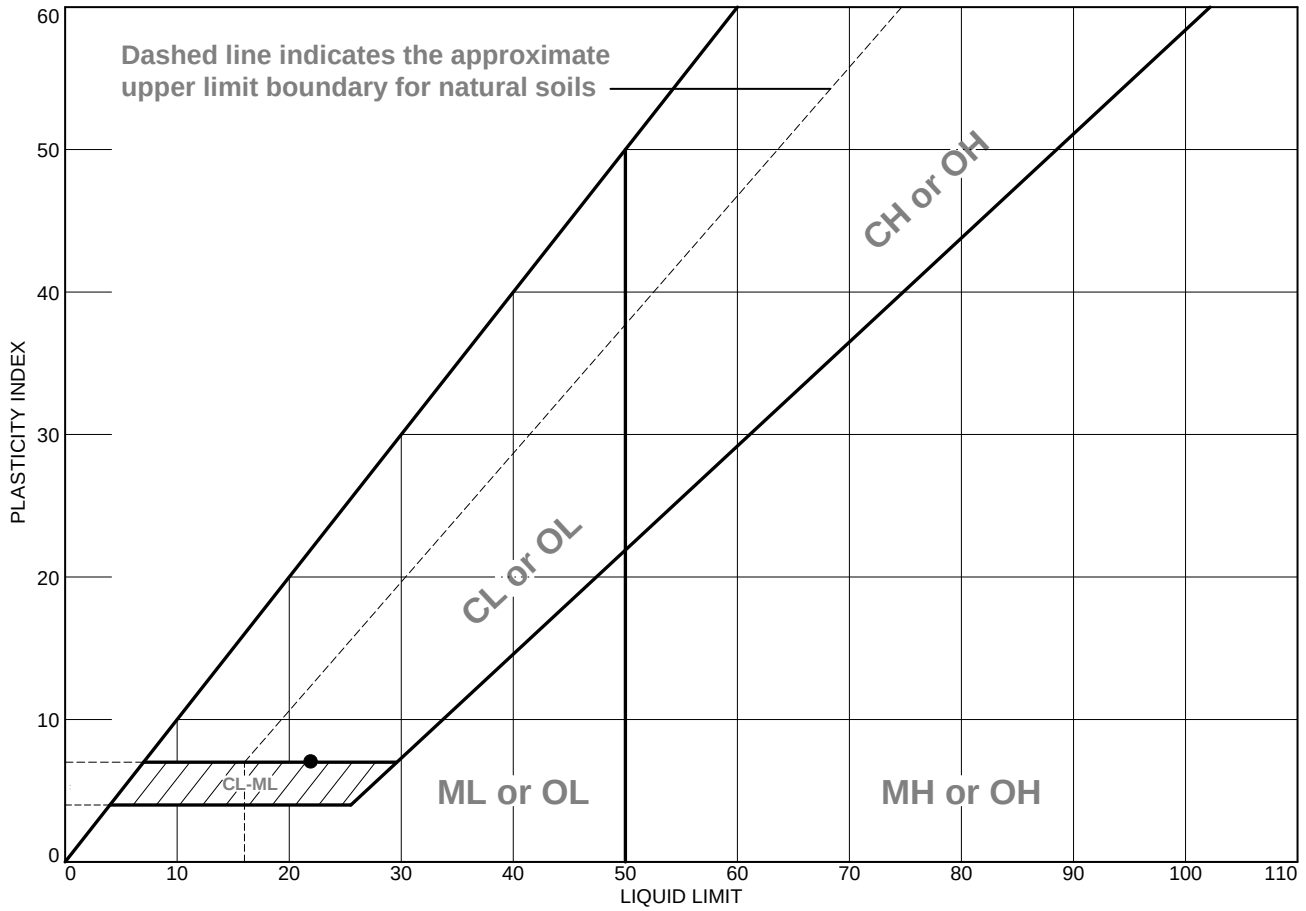
WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	NONE	4/7/2022
AT COMPLETION	NONE	4/7/2022
OTHER	N/A	N/A

SS — SPLIT SPOON
SL — SPLIT SPOON W/SOIL LINER
NQ— ROCK CORE
ST — SHELBY TUBE
AS — AUGER CUTTINGS
SC — SONIC

GINT Report Used: NEWLOGIN Report No.: 204814.GPJ GINT Template Used: OH DOT.GDT Date Printed: 5/5/22

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	B-3, SS3	22	15	7			

Project No. 204814 **Client:** Bradford School Board

Project: Proposed Building and Track

●**Location:** B-3 **Depth:** 6.0' - 7.5' **Sample Number:** SS3

Remarks:

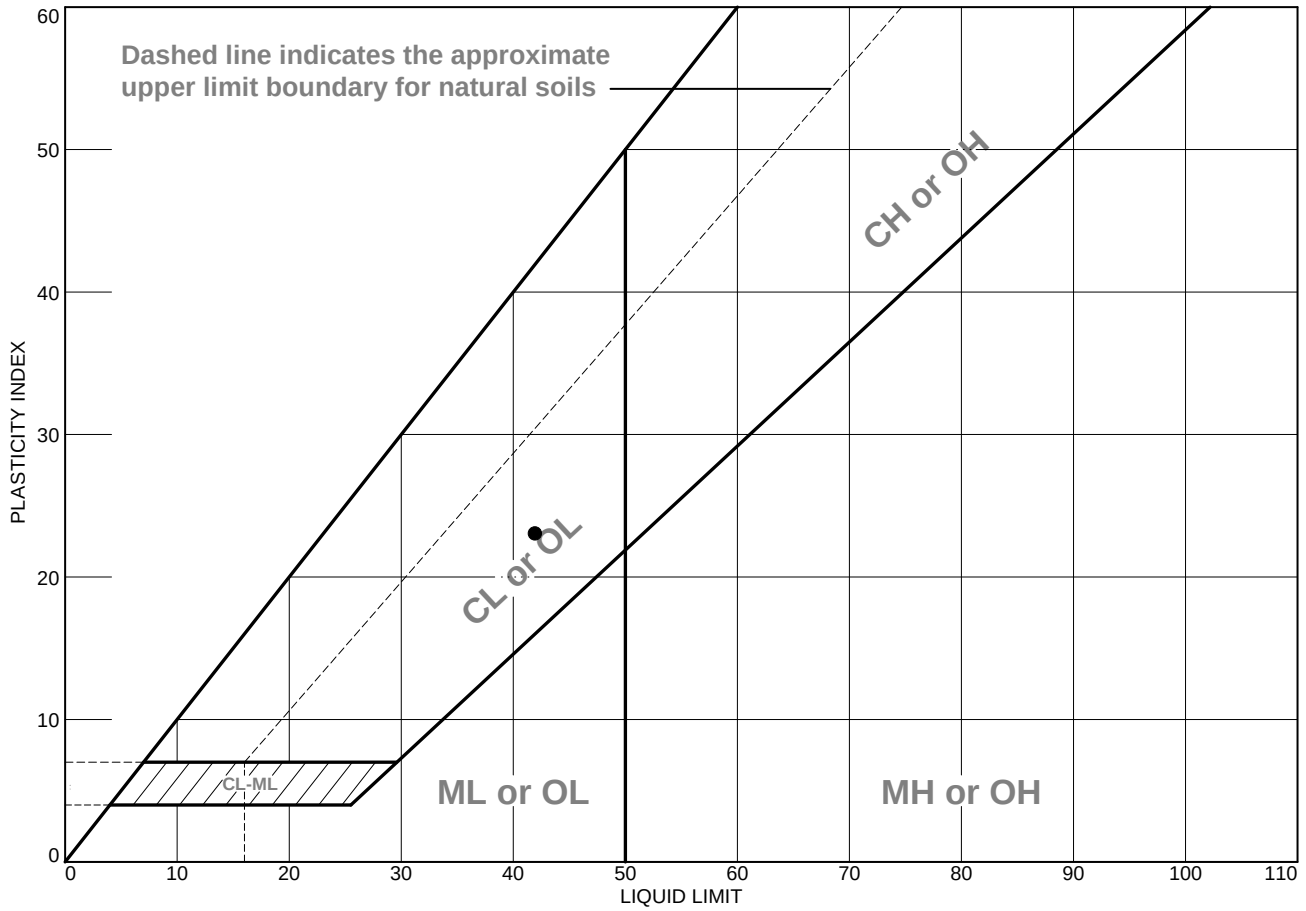
●As Received
Moisture Content: 14.5 %

BOWSER-MORNER, INC.

Dayton, Ohio

Tested By: jw **Checked By:** hr

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	B-6, SS1	42	19	23			

Project No. 204814 **Client:** Bradford School Board

Project: Proposed Building and Track

●**Location:** B-6 **Depth:** 1.0' - 2.5" **Sample Number:** SS1

Remarks:

●As Received
Moisture Content: 20.6 %

BOWSER-MORNER, INC.

Dayton, Ohio

Tested By: hmr **Checked By:** hr

Moisture Content of Soil

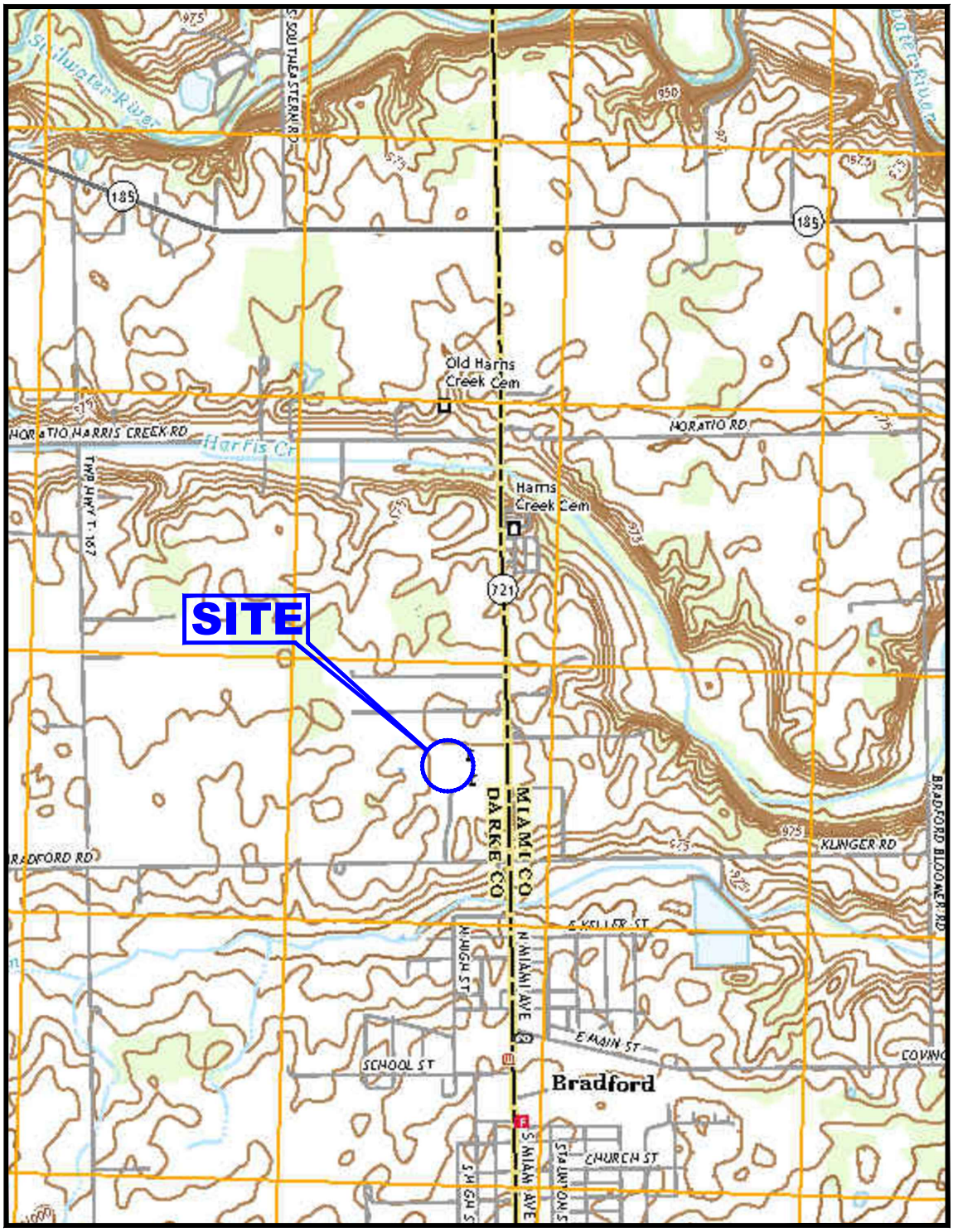
ASTM (D-2216)

BOWSER MORNER

Client: Bradford School Board
Project: Proposed Building and Track

Work Order No.: 204814
Date: 04/26/22

Boring Number	Sample Number	Depth, (ft)	Depth, (m)	Moisture Content, (%)
B-1	SS 1	1.0 - 2.5	0.3 - 0.8	21.4
	SS 2	3.5 - 5.0	1.1 - 1.5	17.9
	SS 3	6.0 - 7.5	1.8 - 2.3	13.0
	SS 4	8.5 - 10.0	2.6 - 3.0	12.5
	SS 5	13.5 - 15.0	4.1 - 4.6	Not Tested
	SS 6	18.5 - 20.0	5.6 - 6.1	Not Tested
B-2	SS 1	1.0 - 2.5	0.3 - 0.8	Not Tested
	SS 2	3.5 - 5.0	1.1 - 1.5	Not Tested
	SS 3	8.5 - 10.0	2.6 - 3.0	14.6
	SS 4	8.5 - 10.0	2.6 - 3.0	13.3
	SS 5	13.5 - 15.0	4.1 - 4.6	14.1
	SS 6	18.5 - 20.0	5.6 - 6.1	7.3
B-3	SS 1	1.0 - 2.5	0.3 - 0.8	18.5
	SS 2	3.5 - 5.0	1.1 - 1.5	Not Tested
	SS 3	6.0 - 7.5	1.8 - 2.3	14.5
	SS 4	8.5 - 10.0	2.6 - 3.0	Not Tested
	SS 5	13.5 - 15.0	4.1 - 4.6	12.2
	SS 6	18.5 - 20.0	5.6 - 6.1	11.0
B-4	SS 1	1.0 - 2.5	0.3 - 0.8	Not Tested
	SS 2	3.5 - 5.0	1.1 - 1.5	26.8
	SS 3	6.0 - 7.5	1.8 - 2.3	17.7
	SS 4	8.5 - 10.0	2.6 - 3.0	19.7
	SS 5	13.5 - 15.0	4.1 - 4.6	12.7
	SS 6	18.5 - 20.0	5.6 - 6.1	Not Tested
B-5	SS 1	1.0 - 2.5	0.3 - 0.8	19.5
	SS 2	3.5 - 5.0	1.1 - 1.5	13.5
	SS 3	6.0 - 7.5	1.8 - 2.3	13.9
	SS 4	8.5 - 10.0	2.6 - 3.0	Not Tested
B-6	SS 1	1.0 - 2.5	0.3 - 0.8	20.6
	SS 2	3.5 - 5.0	1.1 - 1.5	25.1
	SS 3	6.0 - 7.5	1.8 - 2.3	Not Tested
	SS 4	8.5 - 10.0	2.6 - 3.0	Not Tested



USGS QUAD: Versailles, Ohio (2019)

Latitude: 40°09'29"N Longitude: 84°26'06"W

VICINITY MAP

Soil Study for Proposed Building and Track
Bradford High School,
Railroad Avenue, Bradford, Ohio

Client: Bradford Exempted Village School District Board of Education
c/o WDC Group, LLC

04-2022/SR

PROJECT NO.	204814
SCALE	1"=2000'
FIGURE NO.	1

BOWSER MORNER

MAINTAIN EXISTING TREES & MOUNDS WHEN POSSIBLE

PRACTICE FIELD

SHOT PUT

DISCUS

NEW BUS GARAGE

NEW SERVICE DRIVE

EXPANDED MAINTENANCE COURT

EMERGENCY VEHICLE PARKING

LOCKER ROOM ENTRIES

SEAT WALL / PLANTER

NEW FENCE

GATE

FENCE

#1
EL. 100.6'

GATE

GAME OFFICIALS / STAFF PARKING

VISITOR BUS PARKING

SEAT WALL / PLANTER

EXTEND EX. WALK

#5
EL. 104.9'

FIELD ACCESS

LONG JUMP

POLE VAULT

NEW MULTI-PURPOSE BUILDING

#2
EL. 102.4'

TICKET BOOTH

RESTROOMS

CONCESSIONS

ENTRY GATE

Benchmark
Sewer Grate
Assume El. 100.0'

GATE

VISITOR BLEACHERS

#3
EL. 103.2'

#4
EL. 104.4'

NEW FENCE SEPARATES TICKETED AREA FROM PUBLIC ACCESS

HOME BLEACHERS WITH PRESS BOX (1000 SEATS SHOWN)

EXTEND ASPHALT FOR ADDITIONAL PARKING

NEW TRACK AND FOOTBALL STADIUM

WALK TO TICKET GATE

#6
EL. 104.1'

HIGH JUMP

EXIT / PASS GATE

NEW WALK CONNECTS PARKING LOTS TO SPORTS VENUES

GATE

NEW FENCE

N

0 100 200
Approx. Graphic Scale in Feet

BOWSER MORNER

PROJECT NO. 204814

SCALE GRAPHIC

FIGURE NO. 2

04-2022/SR

BORING LOCATION PLAN

Soil Study for Proposed Building and Track
Bradford High School,
Railroad Avenue, Bradford, Ohio
Client: Bradford Exempted Village School District Board of Education
c/o WDC Group, LLC

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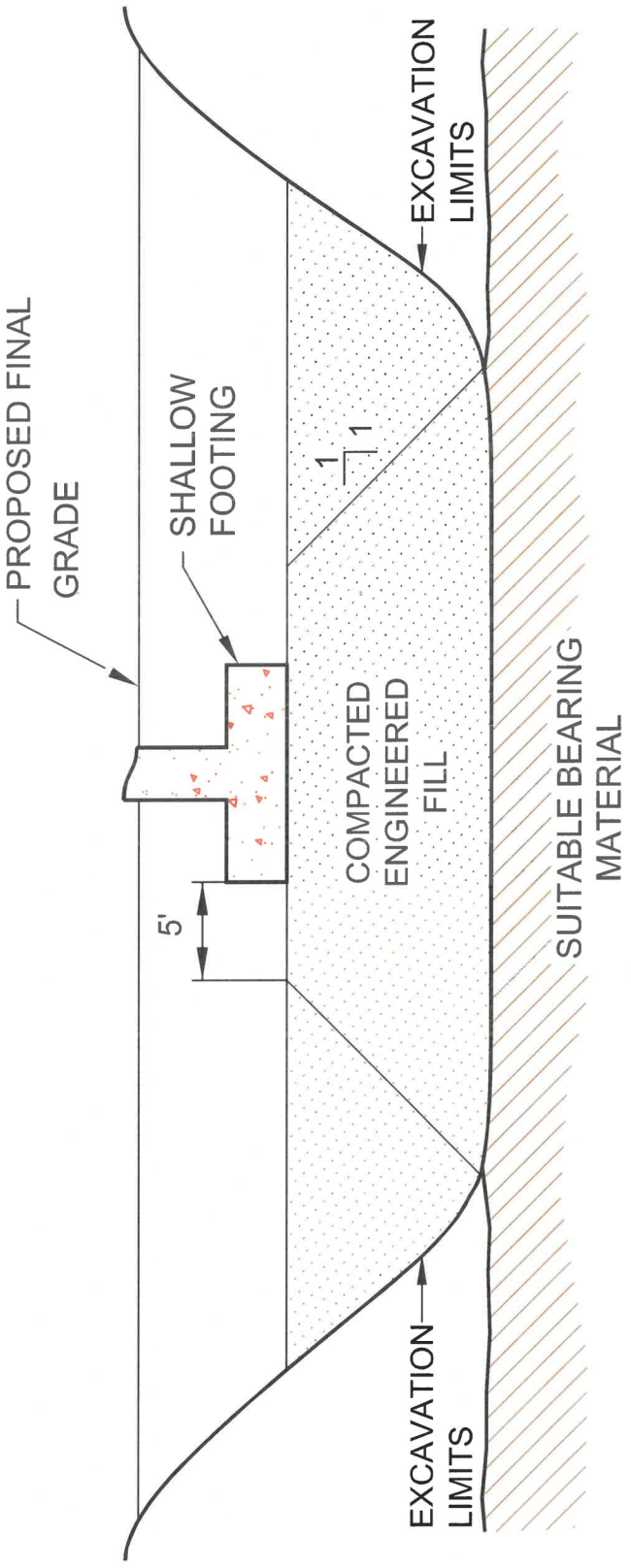

DESIGN ILLUSTRATION SHALLOW FOOTINGS IN AN UNDERCUT AREA

SCALE
NONE

FIGURE NO.
3

BOWSER MORNER

ENGINEERING & ENVIRONMENTAL SERVICES:

Geotechnical Engineering
Subsurface Exploration
Civil Engineering
Environmental Services
Due Diligence
Permitting

LABORATORY SERVICES:

Geotechnical Laboratories
Construction Materials Laboratories
Mineral Aggregates
Concrete
Stone & Masonry
Asphalt
Analytical Services Laboratories
Industrial Minerals
Product Testing
Mechanical/Metallurgical Testing
Calibration Services
Chemistry Laboratory
Consulting Geology
Radon Reference Laboratory

CONSTRUCTION SUPPORT SERVICES:

General Construction
Construction Quality Assurance
Building Code Special Inspections
Transportation Projects:
- Contractor QA/QC
- Material Supplier QA/QC
- Owner Quality Assurance

Materials Consulting:
- Construction Engineering

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

When the information in this Specification Section conflicts with information on the Structural Construction Drawings, the Structural Construction Drawings shall prevail.

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 ACTION SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:
   1. Fiber reinforcement.
   2. Waterstops.
   3. Curing compounds.
   4. Floor and slab treatments.
   5. Vapor retarders.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.03 INFORMATIONAL SUBMITTALS

A. Slab Jointing Plan: Contractor to indicate location of slab-on-grade contraction joints and construction joints.
   1. Joints shall be spaced in a square or rectangular pattern with aspect ratio not to exceed 1.5:1.
   2. Spacing shall not exceed 30 times the slab thickness (in inches).

B. Field quality-control reports, including floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.06 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.07 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.
   1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.
   2. ACI 117.

2.02 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
      c. Structural 1, B-B or better; mill oiled and edge sealed.
      d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips.

C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide rust inhibitor.

D. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.03 CONCRETE MATERIALS

A. Cementitious Materials:
   1. Portland Cement: ASTM C 150, Type I/II, gray.
   2. Fly Ash: ASTM C 618, Class F or C.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, graded.
   1. Maximum Coarse-Aggregate Size: 1 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. Retarding Admixture: ASTM C 494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

E. Water: ASTM C 94 and potable.

2.04 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60, deformed bars,, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.05 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

B. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

C. Epoxy-Coated Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, ASTM A 775 epoxy coated.

D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.

2.06 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.07 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, 15 mils thick low-permeance polyolefin. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products shall include:
      a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
      b. Fortifiber Building Systems Group; Moistop Ultra 15.
      c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
      d. Meadows, W. R., Inc.; Perminator 15 mil.
      e. Reef Industries, Inc.; Griffolyn 15 mil.

f. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.08 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

Verify with manufacturer that retained products have been tested against interference with bonding of floor covering (choose 1 of 4 below, typically).

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.09 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Round Concrete Cast-In-Place Column Fiber Forms: Multiple layers of 100 percent recycled paperboard, spirally wound, and laminated with adhesive.
1. Interior Surface: Smooth with spiral seam. Alathon release and moisture barrier coating.
2. Exterior Surface: Micryl moisture barrier coating.
3. Spiral Mark: Impart visible spiral mark on concrete columns.
4. 1-piece, 1-time-use forms.
5. Recyclable.

C. Form Liner: Sandblast-Fine Thermoform Plastic Formliner

1. Provide formliner per Specification 03121 FORMLINERS FOR ARCHITECTURAL CONCRETE. See Architectural Drawings for limits.

a. Dimensions indicated for wall thickness do not include formliner thickness. Forms to be set to provide finished thickness indicated in Structural Drawings.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.

2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
2. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
3. Use moisture vapor reduction admixture.
a. Products shall include:
1) ISE Logik Industries; MVRA 900
2) CMS/Barrier One, Inc.; CPS Admixture

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion Normal-Weight Concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum W/C Ratio: 0.53.
3. Slump Limit: 4 inches, plus or minus 1 inch.

B. Foundation Walls: Proportion Normal-Weight Concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.48.
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

C. Exterior Slabs-on-Grade: Proportion Normal-Weight Concrete mixture as follows:
1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
3. Maximum W/C Ratio: 0.45.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

D. Interior Slabs-on-Grade including Equipment Housekeeping Pads: Proportion Normal-Weight Concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
3. Maximum W/C Ratio: 0.48.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 3.0 lb/cu. yd.

E. Utility Trench Backfill: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 100 psi at 28 days.
2. Unconfined compression strength per ASTM D4832

F. Flowable Fill at foundations: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 100 psi at 28 days.
2. Unconfined compression strength per ASTM D4832

G. Lean Concrete fill at soft soils: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 1500 psi at 28 days.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.
   2. Class C, 1/2 inch for rough-formed finished surfaces.

D. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

E. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

F. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.03 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.04 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

B. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Coordinate pipe, sleeves, conduits, and other utilities prior to placing concrete.

3.05 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
2. Space vertical joints in walls not to exceed the guidelines as described on the contract documents. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: Install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
4. Provide round isolation joints at all steel columns. Size round column fiber forms to maintain minimum 1-1/2” clearance of base plate.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.07 WATERSTOP INSTALLATION

A. Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions. Install in longest lengths practicable.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project Site, or during placement unless explicitly noted on approved mix design.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
   1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1-part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Housekeeping Pads:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases 4 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Install hooked 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.
   4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
   5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written

instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar. Notify Architect of repairs and provide detailed methods for approval prior to beginning repairs.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of 1-part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface. Defects also include stains and other discolorations in public view that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch-wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place

patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.
7. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may not be used.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency

may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION

SECTION 042200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Steel reinforcing bars.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2650 psi.
2. Density Classification: Normal weight.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91/C 91M.

E. Aggregate for Mortar: ASTM C 144.

1. White-Mortar Aggregates: Natural white sand or crushed white stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Spacing of Cross Rods: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet.

2.5 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized-steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized-steel wire.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-

65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime or masonry cement mortar.
4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type N.
3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior nonload-bearing partitions, Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2-inch-wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.7 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

H. Prism Test: For each type of construction provided, according to ASTM C 1314 at seven days and at 28 days.

3.9 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.10 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 047200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:
   1. Sill block / caps at main entry columns..

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

B. Section 079200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2025.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025b.

I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.

J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
   4. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm) or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.

2.02 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Admixtures: ASTM C494/C494M.

E. Water: Potable.

F. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

I. Mortar: Portland cement-lime, as specified in Section 040511 ; do not use masonry cement.

J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or

damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 042000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch (9.5 mm), except as otherwise detailed.
1. Rake mortar joints 3/4 inch (19 mm) for pointing.
2. Remove excess mortar from face of stone before pointing joints.
3. Point joints with mortar in layers 3/8 inch (9.5 mm) thick and tool to a slight concave profile.
4. Leave the following joints open for sealant:
a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
b. Joints in projecting units.
c. Joints between rigidly anchored units, including soffits, panels, and column covers.
d. Joints below lugged sills and stair treads.
e. Joints below ledge and relieving angles.
f. Joints labeled "expansion joint".

B. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.
2. Variation from Level: Not more than 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches (3 mm in 900 mm) or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch (1.5 mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet (6 m).

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Keep cast stone components clean as work progresses.

B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 055100
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with grating treads.

C. Prefabricated stairs.

D. Structural steel stair framing and supports.

E. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 033000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 055213 - Pipe and Tube Railings: Metal handrails and balusters other than specified in this section.

E. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

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; 2024.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

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 F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025a.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NAAMM AMP 510 - Metal Stairs Manual; 1992.

N. NAAMM MBG 531 - Metal Bar Grating Manual; 2024.

O. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2024.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

R. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general product information including but not limited to place of manufacturer and fabrication..

C. 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.

D. Design Data: As required by authorities having jurisdiction.

E. Design Data, Seismic Performance: Submit documentation that stairs meet performance requirements specified.

1.05 QUALITY ASSURANCE

A. Deligated Design: Structural design of the stair, stringers, support structure and related components is a deligated design by a professional engineer registerd in the State of Ohio.

B. 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.

C. Fabricator Qualifications:
   1. A company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

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. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
      a. Stair Capacity: Uniform live load of 100 lb/sq ft (4.7 kPa) and a concentrated load of 300 lb (and a concentrated load of 14.4 kg) with deflection of stringer or landing framing not to exceed 1/360 of span.
      b. Railing Assemblies: Comply with applicable local code.
   4. At exit stairwells, provide unit stair towers designed for stacking to height of building as a self-supporting structure.
   5. Dimensions: As indicated on drawings.
   6. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   7. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   8. 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.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
1. Concrete Depth: 1-1/2 inches (38 mm), minimum.
2. Tread Pan Material: Steel sheet.
3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
4. Concrete Reinforcement: Welded wire mesh.
5. Concrete Finish: as requried for specified finish material . Trowel finish for exposed areas .

D. Risers: Same material and thickness as tread pans.
1. Nosing Depth: Not more than 1-1/2 inch (38 mm) overhang.
2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.

E. Stringers: Rolled steel channels or HSS as determined by the deligated designer..
1. Stringer Depth: 10 inches (250 mm).

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

2.03 METAL STAIRS WITH GRATING TREADS

A. Jointing and Finish Quality Level: Industrial, as defined above.

B. Risers: Open.

C. Treads: Steel bar grating.
1. Grating Type: Welded.
2. Bearing Bar Depth: 3/4 inch (19 mm), minimum.
3. Top Surface: Standard.
4. Nosing: Checkered plate.
5. Nosing Width: 1-1/4 inch (32 mm), minimum.
6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels or HSS sections as determined by the deligated designer..

E. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

F. Railings: Steel pipe railings.

G. Finish: Galvanized after fabrication.

2.04 PREFABRICATED STAIRS

A. Prefabricated Egress Stairs: Welded unit, factory fabricated to greatest degree practical and in the largest components possible.
1. Design Requirements: Comply with structural design criteria stated elsewhere in this section and applicable local code.

a. Comply with ADA Standards.
b. Comply with applicable sections of the IBC.

2. Materials: Manufacturer's standard steel tubes, plates, bars, shapes, sheets, wire and mesh that comply with requirements of MATERIALS article of this section.
   a. Rails: Manufacturer's standard rails.
      1) Guardrails: 42 inches (1067 mm) high.
      2) Handrails: 30 inches (762 mm) to 38 inches (965 mm) high.
   b. Treads: Manufacturer's standard bar grate.
   c. Finish: Powder coat; color to be selected by Architect from manufacturer's standard range.

2.05 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
   2. Infill at Picket Railings: Vertical pickets.
      a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
      b. Material: Solid steel bar.
      c. Shape: Round.
      d. Size: 1/2 inch (13 mm) diameter.
      e. Top Mounting: Welded to underside of top rail.
      f. Bottom Mounting: Welded to top surface of stringer.
   3. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1 inch (25 mm).
      b. Material: Steel pipe or tube, round.
      c. Vertical Spacing: Maximum 4 inches (100 mm) on center.
      d. Jointing: Welded and ground smooth and flush.
   4. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.06 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.

D. Gratings: Bar gratings that comply with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

E. Concrete Fill: See Section 033000.

F. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.07 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

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.

2.08 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
   2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
   1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

I. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. 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 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Comply with ASTM E985.

C. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

E. Allow for expansion and contraction of members and building movement without damage to connections or members.

F. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
   2. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round.
   3. Posts: 1-1/2 inches (38 mm) diameter, round.
   4. Balusters: 1/2 inch (12 mm) round solid bar.

G. 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.

H. 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 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 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. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Clean welds, bolted connections, and abraded areas.
   4. Touch up shop primer and factory-applied finishes.
   5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonstructural dimension lumber framing.

B. Sheathing.

C. Communications and electrical room mounting boards.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. PS 1 - Structural Plywood; 2023.

C. PS 20 - American Softwood Lumber Standard; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing and application instructions.

C. Product Data: Submit technical data on wood treatment.

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.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for materials and workmanship commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
   1. Grade: No. 2.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.
3. Danback wood blocking is acceptable as an alternative to lumber as indicated.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.
1. Minimum thickness: 5/8".
2. Grade: Structural I sheathing.

2.04 ACCESSORIES

A. Metal and Finish of Fasteners:
1. Untreated Wood: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. 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.

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 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.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide nonstructural framing and blocking to support the following:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Other wall- or ceiling-mounted items indicated on drawings.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

B. Wall Sheathing and Roof Sheathing with Laminated Water-Resistive Barrier and Air Barrier: Secure to studs in accordance with manufacturer's installation instructions.
   1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
   2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
   3. Use only mechanically attached and drainable EIFS and exterior insulation with wall sheathing with laminated water-resistive and air barrier.
   4. Apply manufacturer's standard seam tape to joints between sheathing panels; use tape gun or hard rubber roller in accordance with manufacturer's installation instructions.

3.05 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet (1 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

C. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Hardware.

1.02 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. BHMA A156.9 - Cabinet Hardware; 2020.

E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. PS 1 - Structural Plywood; 2023.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Include certification program label.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.02 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

C. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.03 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3; color as selected by Architect; textured, low gloss finish.

2.04 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming and Blocking: Softwood lumber of recommended species.

C. Plastic Edge Trim: Extruded flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness; color as selected.

D. Primer: Alkyd primer sealer.

E. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 HARDWARE

A. Hardware: Comply with BHMA A156.9.

B. Countertop Support Brackets: Fixed, L-shaped, corner reinforced, face-of-wall mounting.
   1. Product: Rakks EHR-1818, aluminum, mill finish.
      a. Spacing shall be 24" on center minimum. Provide blocking as required as specified in other sections.

2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with plastic trim.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Countertops.

C. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

1.04 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
   2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

B. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.

1.06 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   3. Finish - Semi-Exposed Surfaces: Decorative laminate
   4. Finish - Concealed Surfaces: white malamine.
   5. Door and Drawer Front Edge Profiles: 1.5 mm PVC edge banding.
   6. Casework Construction Type: Type A - Frameless.
   7. Adjustable Shelf Loading: 40 psf (19.5 gm/sq cm).
   8. Cabinet Style: Flush overlay.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 PANEL CORE MATERIALS

A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
   1. Grade: M-2; moisture resistance: MR10.

B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Grade: 115; moisture resistance: MR10.
   2. Panel Thickness: 1 inch (25.4 mm).

2.04 HARDWOOD PLYWOOD PANELS

A. Hardwood Plywood: Plywood manufactured for nonstructural decorative applications; consisting of faces and backs applied to a variety of core types; comply with HPVA HP-1.
   1. Woodwork Quality Standard: Panels complying with specified woodwork quality standard.

2.05 LAMINATE MATERIALS

A. Manufacturers:
   1. Arborite: www.arborite.com/#sle.
   2. Formica Corporation: www.formica.com/#sle.
   3. Wilsonart LLC: www.wilsonart.com/#sle.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded ABS or PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Use at all exposed edges including drawer and door faces, exposed and semi-exposed shelving, countertops edges..

C. Vinyl Countertop Edge: PVC anchor type tee-molding edging in width to match thickness of countertop, color as selected from manufacturer's standard range, used at locations as indicated.

2.07 HARDWARE

A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:

B. Metal Z-Shaped Wall Cabinet Support Clips: Paired, cleated, structural anchorage components applied to back of cabinets and walls for wall cabinet mounting.

C. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

D. Countertop Support Brackets: Fixed, L-shaped, face-of-wall mounting.
   1. Materials: Aluminum sections.
      a. Finish: Mill finished.
      b. Height: 18 inches (460 mm).
   2. Products:
      a. Rakks/Rangine Corporation; EH Series Brackets: www.rakks.com/#sle.

E. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers ("U" shaped wire pull, steel with satin finish, 100 mm centers).

F. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

G. Cabinet Catches and Latches:
   1. Type: Magnetic catch and Push latch.

H. Drawer Slides:
   1. Type: Full extension with overtravel.
   2. Static Load Capacity: Extra Heavy Duty grade.
   3. Mounting: Side mounted.
   4. Features: Provide self closing/stay closed type.

I. Hinges: 5-knuckle hinges, heavy duty type, steel with satin finish.
   1. Provide three hinges minimum per cabinet door at base and wall cabinets typical.

J. Chain stops: Provide chain stops at all wall and base cabinets adjacent to walls, equipment or appliances where the doors will impact such items when fully open.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.

D. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation _____ at cavity wall construction, perimeter foundation wall, and underside of floor slabs.

B. Batt insulation _____ in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 REFERENCE STANDARDS

A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2023.

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; 2024.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2026.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.04 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Materials Program (EAP); www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.05 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 Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.

D. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

E. Insulation in Interior Partition Walls: Batt Insulation unfaced, mineral wool

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with natural skin surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   5. Board Edges: Square.

B. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Comply 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 (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   4. Board Size: 15-3/4 inch by 96 inch (400 mm by 2440 mm).
   5. Board Thickness: 2-1/2 inch (63.5 mm).
   6. Board Edges: Square.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Facing: Unfaced.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: white polyethylene film for above grade application, 10 mil, 0.010 inch (0.25 mm) thick.
   1. Basis of Design: Sivercote Energy Saver Fabric.

B. Structural Thermal Break: Structural foam thermal break material located at column bases to provide continuous insulation requirements at structural connections.
   1. Compressive Strength: TBM-3/4: 48 psi (331 kPa) at 2 percent deflection, when tested in accordance with ASTM C165.
   2. Sheet Size: 48 by 96 inches (1219 by 2438 mm).
   3. Sheet Thickness: 1 inch (25.4 mm).

C. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

D. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
   1. Width: 5-1/2 inches (140 mm).
   2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

E. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

F. Wire Mesh: Galvanized steel, hexagonal wire mesh.

G. 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.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards vertically on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. 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.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.05 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Staple or nail facing flanges in place at maximum 6 inches (152 mm) on center.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

END OF SECTION

SECTION 072113
PRE-ENGINEERED METAL BUILDING INSULATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a high R-value envelope insulation system, also called a “fabric liner system” capable of providing OSHA compliant leading edge fall protection from a single source.

B. Related Sections:
   1. Section 133419 – Metal Building Systems
   2. Section 13121 – Pre-Engineered Metal Buildings
   3. Division 15 – Mechanical; Rough-In Utilities
   4. Division 16 – Electrical; Rough-In Utilities

1.2 REFERENCES

A. Selected materials for this fabric liner system shall meet the property requirements of one or more of the following standards as applicable to the specific project and end use:
   1. American Society for Testing of Materials (ASTM):
      a. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
      b. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure B)
      c. ASTM C 665 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
      d. ASTM C 1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
      e. ASTM C 991, Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings
      f. ASTM C 553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
      g. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C
      h. ASTM C 411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
   2. National Fire Protection Association (NFPA)

a. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

3. Underwriters Laboratories (UL):
    a. UL 723 - Tests for Surface Burning Characteristics of Building Materials

1.3 DESIGN REQUIREMENTS

A. Insulation R-value of 25+8 for roof System
    1. Required U-Value 0.037.
B. Insulation R-value of 30 for wall System
    2. Required U-Value 0.052.
C. Insulation shall completely fill cavity spaces
D. Roof and Wall system shall provide a continuous vapor barrier
E. Roof system shall provide leading edge fall protection as per OSHA 29 CFR 1926.502 and installed by certified contractor with training and documentation provided by the manufacturer
F. Use glass wool fiber certified equal to, or greater than 50% recycled content
G. System manufacturer able to provided thermal performance results from standard testing methods such as, but not limited to Hot Box testing of pertinent envelope solutions

1.4 SUBMITTALS

A. Manufacturer shall provide the following on system and materials:
    1. Roof Installation Instructions
    2. Wall Installation Instructions
    3. Fabric Liner Technical Data Sheet
    4. Metal Building Insulation Technical Data Sheet
    5. System Brochure and Design Consideration Guide
    6. ComCheck data upon request direct from manufacturer
    7. Technical support direct from manufacturer available
B. Shop Drawings: Provide shop drawings that indicate the following:
    1. Liner fabric layout on building drawings
    2. Insulation layout on building drawings and cut list
    3. Verification of customer information and contact information
    4. Verification of project location and specific information
    5. Storage and handling requirements and recommendations

1.5 QUALITY ASSURANCE

1. Material orders are placed and processed based only on final and construction drawing sets to ensure proper fit and accuracy of design intent

2. Manufacturer Qualifications: Company specializing in manufacturing high R-Value insulation envelope systems specified in this section with minimum five years documented experience
3. Manufacturer is an Associate Member of MBMA (Metal Building Manufacturers Association)
4. Installer Qualifications: Installer has completed online certification course for OSHA Fall Protection Compliance and has documented history of safely completing projects metal building insulation envelope systems
5. Insulation system components to include a ten-year limited material warranty
6. System manufacturer is same as insulation provider ensuring proper and consistent supply of required product
7. Material testing on fabric liner at welds is performed every 5000 SqFt, testing for material integrity and consistency

1.5 DELIVERY, STORAGE AND HANDLING

A. Insulation to be delivered, labeled per building and panel/wall, color tagged to corresponding building and panel/wall.
B. Delivered separated by the system manufacturer for easy job site movement and placement according to corresponding color coded cut list and project drawings sent with material
C. Store products in manufacturer's unopened packaging until ready for installation
D. Store products indoors and protect from moisture, construction traffic, and damage.

1.6 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 absolute limits.

PART 2 PRODUCTS

2.2 MATERIALS

A. Acceptable System: consisting of unfaced metal building insulation, straps, banding and other devices and components designed as a complete system as follows:
    1. Metal Building Insulation: ASTM C 991 Type 1; ASTM C 553 Type 1, 2, formaldehyde-free glass mineral wool conforming to the following:
        a. Total Thermal Resistance: R-value of 30 for walls, R-25+8 for the roof.
        b. Total R-value is the sum of single or combined layers of ECOSE® Metal Building Insulation to accomplish specified U-Value or energy code
        c. Meets NFPA 255, UL 723 and ASTM E 84 ratings of 25/50
        d. Passes ASTM C 411, meeting maximum temperature standards, 350 F (177 C)
        e. Passes ASTM C1617 standards for Corrosion impact on metals

f. Passes ASTM C 665 standards and does not accelerate corrosion of steel

2. Vapor barrier fabric: A woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or designated color polyethylene film.
   a. Fabric is folded or rolled (based on erector preference) to allow for rapid pullout on the strap support system
   b. Product complies with ASTM C 1136 for low permeance vapor retarders for thermal insulation; 2000
   c. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96
   d. Flame/Smoke Properties: 25/50 in accordance with ASTM E 84
   e. ASTM D 751 Compliant using all following testing; Mullen Burst (minimum 235 psi), Grab, Strip, Tongue
   f. ASTM C 1263 – Thermal Stability – No Cracks or Delamination @ 20 Degrees F / 150 Degrees F
   g. ASTM D 1204 – Dimensional Stability – Warp Neg 1.0% / Weft Neg 2.0%
   h. ASTM C 1336 – No Growth (Fungi Resistance)
   i. Light Reflectance Value: < 80
   j. UV Weathering Additives for extra protection
   k. Hot Air Welded Seams – Per project material testing at 5000 SqFt
   l. Fabric widths and sizes manufactured per project details

4. Banding:
   a. 1” Wide
   b. White Painted Zinc Coated Banding (Multiple Colors Available)
   c. Minimum Thickness: .022”
   d. Cold Rolled to Meet ASTM A 653-05A
   e. Steel Grade: 60
5. Banding Clips (US Patent: 8015769):
   a. Fastened with Single #12-24 TEK5 (1 ¼”) self-drilling screw into end wall rafters and a single #12-14 TEK3 (3/4”) self-drilling screw into the eave struts
   b. Provide clean appearance while minimizing number of fasteners required
   c. Works with other Energy Saver™ components to properly pass 400 pound drop test (per OSHA 1926.502) for Energy Saver FP™
6. Insul-Hold – Used to support glass mineral wool insulation in the wall girt cavity. Can be cut to length to fit metal frame
7. Adhesive – High shear, high tack adhesive bonds the fabric to the steel framing
8. Patch Tape – Designed to match the appearance of the fabric. Used to seal cuts around protrusions
9. Energy Saver™ Foam Tape – Applied to the outer secondary steel to help reduce heat transfer

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building structure including all bracing and any concealed building systems are completed and approved prior to installing liner system and insulation in the structure.
B. Examine areas and conditions under which work of this section will be installed and verify that adjacent materials are dry and ready to receive insulation.
    1. Correct any unsatisfactory conditions before proceeding
    2. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

3.2 INSTALLATION – GENERAL

A. Install in accordance with included manufacturer's installation instructions for roof and walls.
B. Maintain thermal performance by tightly abutting adjacent insulation. Maintain vapor retarder integrity by adhering (glue or tape is acceptable) to the rafters and eave struts in accordance with manufacturer's installation instructions.
C. Repair punctures or tears in vapor retarder facing by taping or splicing patches of vapor barrier material per manufacturer's instructions.

3.3 CLEANING

A. Clean fabric with a soft cloth and soap and water. Avoid solvent-based cleaners and abrasive pads.
B. Remove scraps and debris from the site

3.4 PROTECTION

A. Protect system products until completion of installation.
B. Repair or replace damaged products before completion of insulation system installation.

END OF SECTION

SECTION 072500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 DEFINITIONS

A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.

B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.03 REFERENCE STANDARDS

A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2017, with Editorial Revision (2019).

B. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2025.

C. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).

D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

E. ASTM D779 - Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016 (Reapproved 2022).

F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

I. ASTM E1677 - Standard Specification for Air Barrier (AB) Material or Assemblies for Low-Rise Framed Building Walls; 2025.

J. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2025.

K. ASTM E2556/E2556M - Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment; 2010 (Reapproved 2022).

L. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIERS

A. Drainable Water-Resistive Barrier Membrane: Nonwoven, polypropylene membrane with fiber-layer drainage plane.
   1. Thickness: 25 mils, 0.03 inch (0.64 mm).
   2. Basis Weight: 3.01 oz/sq yd (102 g/sq m).
   3. Drainage Efficiency: 94.8 percent when tested in accordance with ASTM E2273.
   4. Water-Resistive Classification: Type II water-resistive barrier material, when tested in accordance with ASTM E2556/E2556M.
   5. Air Barrier Classification: Type I air barrier material, when tested in accordance with ASTM E1677.
   6. Water Vapor Permeance: 9 to 15 perms (510 to 860 ng/(Pa s sq m)), when tested in accordance with ASTM E96/E96M, Procedure A.

2.02 ACCESSORIES

A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.

B. Flashings and Sealants: As recommended by water-resistive barrier manufacturer for application.

C. Flexible Flashing: Self-adhering sheet flashing complying with ASTM D1970/D1970M; waive slip resistance requirement if not installed on roof.
   1. Width: 3 inches (76.2 mm).

2.03 FASTENERS

A. Air- and Moisture-Sealing Insulation Fasteners: Preassembled fastener units consisting of sealing washer, screw, and gasketing tube.

B. Self-Sealing Washers: Solid plastic, 2 inch (25 mm) diameter washers; seals building-wrap air barriers against air penetration.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Install continuous water-resistive barriers where indicated on drawings, with sheets lapped to shed water.

C. Mechanically Fastened Sheets:
   1. Install sheets in shingle fashion to shed water; align horizontally.
   2. Overlap seams as recommended by manufacturer, 6 inches (152 mm), minimum.
   3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches (305 mm), minimum.
   4. Install water-resistive barrier over jamb flashings.
   5. Install head flashings under water-resistive barrier.
   6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

D. Openings and Penetrations in Exterior Water-Resistive Barriers:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto water-resistive barrier and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
   2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
   3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
   4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches (50 mm) beyond face of jambs; seal water-resistive barrier to flashing.
   5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 074213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, with insulation, related flashings, and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wall panel substrate.

B. Section 072500 - Weather Barriers: Weather barrier under wall panels.

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. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

E. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, _____, and methods of anchorage.

C. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.

D. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 15-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Concealed Fasteners:
1. Berridge Manufacturing Company; Board and Batten Panel: www.berridge.com/#sle.
2. Dimensional Metals, Inc.; Board and Batten Panel: www.dmimetals.com.
3. Construction Metal Products, Inc; Board and Batten Panel : www.cmpmetalsystems.com/#sle.
4. MAC Architectural Metals, a Cornerstone Building Brands Company; Board and Batten 12": www.macmetalarchitectural.com/#sle.
5. McElroy Metal; Nostalgia Board and Batten: www.mcelroymetal.com/#sle.
6. Pac-Clad; Board and Batten: www.pac-clad.com.
7. Substitutions: See Section 016000 - Product Requirements.

2.02 METAL WALL PANEL SYSTEM

A. Exterior Wall Panels:
1. Profile: Vertical; Board and Batten style..
2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
3. Material: Precoated aluminum sheet, 24 gauge, 0.032 inch (0.812 mm) minimum thickness.
4. Panel Width: 12 inches (304 mm).
5. Color: Matte black.
6. Texture: embossed wood grain texture.
7. Panels shall have slotted holes for fastening to substrate.

B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
1. Exterior trim colors may be different than the siding.

C. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gauge, ___ inch (___ mm) thick; manufacturer's standard brake formed type, of profile to suit system.

D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
1. Trim color may be different than the siding.

E. Anchors: As recommended by the manufacturer..

2.03 MATERIALS

A. Precoated Aluminum Sheet: ASTM B209/B209M, 3105 alloy, O temper, with wood grain texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
1. Trim shall be of same material but have a smooth texture.

2.04 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify weather barrier, see Section 072500, has been installed over wall panel substrate; See Section 061000.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Lap panel ends 2 inches (51 mm), minimum.

C. Provide expansion and control joints where indicated.

D. Use concealed fasteners unless otherwise indicated by Architect.

E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

F. Fasteners: do not overdrive fasteners. Fasteners shall be installed snug but shall allow movement of the panel for thermal expansion and contraction.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch (1.6 mm), maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch (6.4 mm), maximum.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.02 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. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

D. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products; 2018 (Reapproved 2024).

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement; 2025.

H. CDA A4050 - Copper in Architecture - Handbook; Current Edition.

I. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit manufacturer's standard color range of samples, 2 by 2 inches (50 by 50 mm) in size, illustrating material of typical standing seam.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal.

B. Anodized Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 0.032 inch (0.81 mm) thick; clear anodized finish.

C. Stainless Steel: ASTM A666/A666M, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch (0.40 mm) thick; smooth No. 4 - Brushed finish.

2.02 PREPAINTED, METALLIC-COATED STEEL SHEETS

A. Description: Factory-applied coatings applied to metallic-coated steel sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed, top side of sheet; washcoats on bottom, unexposed sheet side.

B. Comply with ASTM A755/A755M.

C. Metallic-Coated Steel Sheet Substrates:
   1. Zinc-Coated, Galvanized, Steel Sheets: Commercial steel sheets, galvanized by hot-dip process; comply with ASTM A653/A653M; coating designation G90 (Z275).

D. Substrate Preparation for Prefinishing: Clean and prepare substrate surfaces in accordance with coating manufacturer's recommendations for substrate type and application.

E. Washcoats or Backercoats: Provide washcoats or backercoats in accordance with organic coating manufacturer's recommendations.

F. Primer Coats: Provide basecoat primers in accordance with coating manufacturer's recommendations for substrate type, topcoat, and application.

G. High-Performance Organic Coating System: Provide thermally cured, 50-percent PVDF or silicone-modified polyester systems in accordance with AAMA 2604; tested for weathering for 5 years with 5 delta units maximum of color change.

H. Application: Coping Caps, Parapet Caps, Cleats, Flashing, Counterflashing, Sill Flashing, Gravel Stops, Gutters, Downspouts, Scuppers, Roof Expansion Joints, Trim, and _____.
   1. Base Metal Thickness: 22 gauge, 0.030 inch (0.76 mm), minimum.
   2. Coating System: High-performance organic coating system.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of _____ type sheet metal, minimum ____ inches (____ mm) wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

H. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing _____. Return and brake edges.

2.04 GUTTERS AND DOWNSPOUTS

A. Gutters: SMACNA (ASMM) Rectangular profile.

B. Downspouts: Rectangular profile.

C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with ICC (IPC).

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3,000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.

F. Downspout Boots: Cast iron.

G. Downspout Extenders: Same material and finish as downspouts.

H. Seal metal joints.

2.05 FLASHING

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.06 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place with concealed fasteners.

F. Slope gutters 1/4 inch per 10 feet (2.1 mm per m), minimum.

G. Connect downspouts to downspout boots, and grout connection watertight.

H. Set splash pads under downspouts.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Snow guards.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for _____. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 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. Applications: Roof curbs used for exhaust fans.
   2. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   3. Sheet Metal Material:
      a. Aluminum: 0.080 inch (2.03 mm) minimum thickness, with 3003 alloy, and H14 temper.
         1) Finish: Mill finish.
         2) Color: As selected by Architect from manufacturer's standard line of colors.
   4. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.

b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.

B. Roof Curb Caps: Square-type aluminum cap with weathertight seal when vent or equipment is not installed.

2.02 SNOW GUARDS

A. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.
1. Brackets: Zinc plated steel.
2. Pipe or Square Tube: Mill finish.
a. Outside Diameter, Round: 1 inch (25.4 mm), nominal.
b. Outside Dimensions, Square: 1 inch (25.4 mm), nominal.
c. Threaded Couplings: Match pipe or tube, manufacturers standard.
d. Sleeve Couplings: Manufacturer's standard material.
e. Ice Flags: Manufacturer's standard material.
f. End Collars and Caps: Metal to match tube.
3. Solid Rod: Aluminum, mill finish.
a. Threaded Couplings: Aluminum, mill finish, manufacturers standard.
b. Sleeve Couplings: Manufacturer's standard material.
1) Length: 3 inch (76 mm), nominal.
c. Ice Flags: Manufacturer's standard material.
4. Extruded Aluminum Channel: Manufacturer's standard shape; with slot for insertion of metal trim matching roof.
5. Supplemental Plates and Clips: Attached to horizontal component; match finish of pipe, tube, rod, or channel.
6. Clamps for Standing Seam Roof: Aluminum clamps attached to standing seams of roof panels; for attachment of fence type snow guard.
a. Seam Profile: Selected by Architect from manufacturer's standard range; match profile of metal roof.
b. Finish: Mill finish.
7. Products:
a. Alpine SnowGuards; ASG4025-AL Standing Seam Two-Pipe Snow Guard: www.alpinesnowguards.com/#sle.
b. Construction Metal Products, Inc; Construction Metal Snow Guards: www.aceclamp.com/#sle.
c. Metal Roof Innovations, Ltd. S-5! Attachment Solutions; ColorGard: www.s-5.com/#sle.

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.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Spray-applied joint sealants.

B. Nonsag gunnable joint sealants.

C. Self-leveling pourable joint sealants.

D. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

K. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Executed warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints:
      a. Seal open joints except open joints indicated on drawings as not sealed.
   2. Interior Joints:
      a. Seal open joints except specific open joints indicated on drawings as not sealed.
      b. Seal the following joints:
         1) Joints between door frames and window frames and adjacent construction.
   3. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.
      e. Joints between suspended ceilings and walls.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: As indicated on drawings.

2.03 NONSAG JOINT SEALANTS

A. Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.

4. Color: To be selected by Architect from manufacturer's standard range.
5. Service Temperature Range: Minus 65 to 180 degrees F (Minus 54 to 82 degrees C).

B. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
1. Color: selected from full range.

C. Acrylic-Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; paintable; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).

E. Acrylic Latex Sealant: ASTM C834; for use as acoustical sealant and in firestopping systems for expansion joints and through penetrations.
1. Fire Rated System: Complies with UL 263 and ASTM E119 with UL fire resistance classifications.

2.04 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.

2.05 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

C. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing: Glass for doors and borrowed lites.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. NFPA: National Fire Protection Association.

F. SCIF: Sensitive Compartmented Information Facility.

G. SDI: Steel Door Institute.

H. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2026.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

H. ASTM C143/C143M - Standard Test Method for Slump of Concrete; 2026a.

I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.

O. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2026.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

E. Design Submittals: Manufacturer to submit anchor design analysis calculations for blast-resistant doors signed and sealed by specialty design engineer experienced in this type of work and licensed in the State in which the Project is located.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
4. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
5. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
6. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.

4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
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 2 - Seamless.
   d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
5. Door Face Sheets: Flush.
6. Weatherstripping: Refer to Section 087100.
7. Door Finish: Factory primed and field finished.

C. Interior Doors, Non-Fire-Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 2 - Heavy-duty.
   b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 2 - Seamless.
   d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
4. Door Face Sheets: Flush.
5. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
2. Frame Finish: Factory primed and field finished.
3. Weatherstripping: Separate, see Section 087100.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.

1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
2. Frame Finish: Factory primed and field finished.

D. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

E. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

F. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (102 mm) high to fill opening without cutting masonry units.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch (0.4 mm) dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities. Use at all doors installed in masonry.

2.06 ACCESSORIES

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
1. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel.
2. Glazing: 1/4 inch (6.4 mm) thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

B. Glazing: As specified in Section 088000, factory installed.
1. Glazing for lites in exterior doors shall be 1" insulating units with tempered glass.

C. Removable Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

F. 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.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 087100.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

END OF SECTION

SECTION 083313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough openings.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 092116 - Gypsum Board Assemblies: Rough openings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Installer's qualification statement.

E. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 WARRANTY

A. Manufacturer Warranty: Provide 2-year manufacturer warranty for counterbalance shaft assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. Clopay: www.clopaydoor.com/#sle.
   2. Basis of Design: Overhead Door Corporation; Counter Door - Model 652: www.overheaddoor.com/#sle.
   3. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.

2.02 COILING COUNTER DOORS

A. Coiling Counter Metal Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Mounting: Interior face mounted.
   2. Nominal Slat Size: 1-1/4 inches (32 mm) wide.
   3. Slat Profile: Flat.
   4. Finish, Aluminum: Anodized.
   5. Guides: Formed track; same material and finish unless otherwise indicated.
   6. Hood Enclosure: Manufacturer's standard; aluminum. Include end cap enclosures of same material.

7. Manual push up operation.
    a. Provide hand crank.

2.03 COMPONENTS

A. Metal Curtain Construction: Interlocking, single-thickness slats.
    1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
    2. Curtain Bottom: Fitted with tube to provide reinforcement and positive contact in closed position.
    3. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch (1.3 mm).

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
    1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Lock Hardware:
    1. Slide Bolt: Provide on both-jamb sides, extending into slot in guides, with padlock on one side.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that door opening is plumb, header is level, and dimensions are correct.

C. Notify Architect of any unacceptable conditions or varying dimensions.

D. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).

C. Maximum Variation From Level: 1/16 inch (1.5 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 085113 - Aluminum Windows: Operable sash within glazing system.

C. Section 087100 - Door Hardware: Hardware items other than specified in this section.

D. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2026.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2025.

C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

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 E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2026.

K. 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).

L. 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).

M. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

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 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and 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. Samples: Submit two samples in illustrating finished aluminum surface, glass, infill panels, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Specimen warranty.

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 three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 017800 - 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. Provide 20 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. Aluminum-Framed Storefronts and Entrance Doors:
   1. Kawneer North America: www.kawneer.com/#sle.
   2. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   3. Tubelite, Inc: www.tubeliteinc.com/#sle.

4. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken (exterior locations):
   1. Basis of Design: Kawneer 451T.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (50 mm wide by 114 mm deep).

B. Front-Set Style, Not Thermally-Broken (interior locations):
   1. Basis of Design: Kawneer 450.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (50 mm wide by 114 mm deep).

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Oldcastle BuildingEnvelope; www.oldcastlebe.com/#sle.
   2. Tubelite, Inc: www.tubeliteinc.com/#sle.
   3. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wind-Borne-Debris Resistance Tested:
   1. Basis of Design: Kawneer 500T.
   2. Thickness: 2-3/16 inch (55.6 mm).

B. Wide Stile, Monolithic Glazing:
   1. Basis of Design: Kawneer 500 Heavy Wall.
   2. Thickness: 1-3/4 inches (43 mm).

C. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer 500T.
   2. Thickness: 2-1/4 inches (57.1 mm).

D. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:as listed in approved manufacturers.
   1. Oldcastle BuildingEnvelope; www.oldcastlebe.com
   2. Tubelite, Inc: www.tubeliteinc.com
   3. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.04 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   2. Finish Color: black.
      a. Note: Doors at the main entry vestibule (interior and exterior) will have high performance organic coating with a custom color to match the Owner's sample.
   3. 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.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. 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.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.
10. Preparation for Window Treatments: Provide reinforced interior horizontal head rail where window treatments are to be fastened to head.

B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   a. Design Wind Loads: Comply with requirements of ASCE 7.
   b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code FLA (PAD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
3. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).
4. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.
5. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
6. Delection limited to L/175 perpendicular to wall plane and L/360 or 1/8 inch whichever is greater parallel.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Glazing Stops: Flush.

B. Glazing: See Section 088000.

C. Infill Panels: Insulated, steel, with edges formed to fit glazing channel and sealed.
1. Total Nominal Thickness: 1 inch (25.4 mm).
2. Core: Rigid expanded polystyrene insulation core
3. Exterior Finish: Superior performing organic coatings.
4. Interior Finish: Superior performing organic coatings.

D. Swing Doors: Glazed aluminum.
1. Thickness: 1-3/4 inches (43 mm).
2. Top Rail: 5 inches (____ mm) wide.
3. Vertical Stiles: 5 inches (____ mm) wide.
4. Bottom Rail: 6 inches (152 mm) wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Fasteners: Stainless steel.

D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch (0.81 mm) minimum thickness; finish to match framing members.

E. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch (0.43 mm) minimum thickness.

F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

G. Sealant for Setting Thresholds: Non-curing butyl type.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

B. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils (0.018 mm) thick.

C. High Performance Organic Coating: Primer and topcoat coatings system based on super durable polyester resin powder containing high level of isophthalic acid; with minimum dry film thickness (DFT) of 2 to 3.5 mil, 0.0020 to 0.0035 inch (0.051 to 0.089 mm) over aluminum extrusions and panels; meeting requirements of AAMA 2604.

2.08 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: See Section 087100.

C. Other Door Hardware: Storefront manufacturer's standard type to suit application.
   1. Finish on Hand-Contacted Items: satin chrome.
   2. For each door, include butt hinges, pivots, push handle, and pull handle. Refer to hardware sets for hardware required for each door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install 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. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 088000.

K. 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 (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area illustrating variance of conditions..
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

B. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 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.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 085113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with operating sash and infill panels.

B. Factory glazing.

C. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.

B. Section 079200 - Joint Sealants: Sealing joints between window frames and adjacent construction.

C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).

B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2026.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

D. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2026.

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 E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

L. 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).

M. ASTM F2090 - Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations, operable sections, and installation requirements.

D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Wausau - 420i.

B. Other Acceptable - Aluminum Window Manufacturers:
   1. Peerless Products, Inc; _____: www.peerlessproducts.com/#sle.
   2. EFCO Windows; www.archonfentech.com/efco
   3. Oldcastle Building Envelope; www.obe.com.
   4. Kawneer; www.kawneer.com

2.02 BASIS OF DESIGN - AW PERFORMANCE CLASS WINDOWS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of AW, and Performance Grade at least as high as specified design pressure.

2.03 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Operable Units: Double weatherstripped.
   2. Provide factory-glazed units.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   6. 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.

B. Inswinging Hopper Type:
   1. Construction: Thermally broken.
   2. Provide screens.
   3. Glazing: Insulating glass units, tempered; clear; transparent.
   4. Exterior Finish: Class I color anodized.
   5. Interior Finish: Class I color anodized.

2.04 HARDWARE

A. Sash lock: Lever handle with cam lock.

B. Window Opening Control Devices (WOCD): Provide operable window sash hardware that limits window opening to prevent passage of 6-inch (102 mm) diameter rigid sphere and is easily releasable to allow full window opening without use of keys, tools, or special knowledge. Comply with ASTM F2090.

C. Pulls: Manufacturer's standard type.

D. Limit Stops: Resilient rubber.

2.05 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42, integrally colored anodic coating not less than 0.7 mil (0.018 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 072500.

3.02 PRIME WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Set sill members and sill flashing in continuous bead of sealant.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install operating hardware not pre-installed by manufacturer.

H. Install glass and infill panels in accordance with requirements; see Section 088000.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m), whichever is less.

3.04 FIELD QUALITY CONTROL

A. Provide field testing of installed aluminum windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
   1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf (91 Pa).
   2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf (75 Pa).

B. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08 71 00
FINISH HARDWARE.

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for swinging doors
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead door hardware

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 06 Section “Rough Carpentry”
3. Division 06 Section "Finish Carpentry”
4. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

    a. “Hollow Metal Doors and Frames”
    b. “Interior Aluminum Doors and Frames”
    c. "Aluminum-Framed Entrances and Storefronts"

6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 “Electrical” sections for connections to electrical power system and for low-voltage wiring.

1.02 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

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/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
2. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit 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.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

a. Wiring Diagrams: For power, signal, and control wiring and including:
1) Details of interface of electrified door hardware and building safety and security systems.
2) Schematic diagram of systems that interface with electrified door hardware.
3) Point-to-point wiring.
4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
c. Indicate complete designations of each item required for each opening, include:
    1) Door Index: door number, heading number, and Architect's hardware set number.
    2) Quantity, type, style, function, size, and finish of each hardware item.
    3) Name and manufacturer of each item.
    4) Fastenings and other pertinent information.
    5) Location of each hardware set cross-referenced to indications on Drawings.
    6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    7) Mounting locations for hardware.
    8) Door and frame sizes and materials.
    9) Degree of door swing and handing.
    10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.

b. Catalog pages for each product.
c. Factory order acknowledgement numbers (for warranty and service)
d. Name, address, and phone number of local representative for each manufacturer.
e. Parts list for each product.
f. Final approved hardware schedule edited to reflect conditions as-installed.
g. Final keying schedule
h. Copies of floor plans with keying nomenclature
i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
j. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80.

a. Written report to be provided to the Owner and be made available to the Authority Having Jurisdiction (AHJ).
b. Report to include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

2. Submit a written report of the results of functional testing and inspection for required egress door assemblies, in compliance with NFPA 101.

a. Written report to be provided to the Owner and be made available to the Authority Having Jurisdiction (AHJ).
b. Report to include the door number for each required egress door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

a. Warehousing Facilities: In Project's vicinity.
b. Scheduling Responsibility: Preparation of door hardware and keying schedules.
c. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
d. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
1) Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

    a. Comply with governing accessibility regulations cited in “REFERENCES” article, herein for door hardware on doors in an accessible route.

C. Pre-Installation Meetings

1. Keying Conference

    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
        1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
        2) Preliminary key system schematic diagram.
        3) Requirements for key control system.
        4) Requirements for access control.
        5) Address for delivery of keys.

2. Pre-installation Conference

    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.
    e. Review required testing, inspecting, and certifying procedures.
    f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

    a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer’s original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 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.

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category will not be considered or allowed.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. 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 including prepared for paint surfaces to receive painted finish.

3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Best FBB series

2. Acceptable Manufacturers and Products:

a. Hager BB series
b. Ives 5BB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. 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.
8. 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.
9. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins

10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage 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.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Best 661HD series – Aluminum and FRP Doors
       Best 662HD series – Hollow Metal and Wood Doors

2. Acceptable Manufacturers:

    a. Ives 112HD series – Aluminum and FRP Doors
       Ives 224HD series – Hollow Metal and Wood Doors
    b. ABH A110HD series – Aluminum and FRP Doors
       ABH A240HD series – Hollow Metal and Wood Doors

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
7. 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.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer:

a. Best

2. Acceptable Manufacturers:

a. Von Duprin
b. ABH

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Trimco

2. Acceptable Manufacturers:

a. Ives
b. Rockwood

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Trimco

2. Acceptable Manufacturers:

a. Ives
b. Rockwood

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.08 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Best 45H series

2. Acceptable Manufacturers and Products:

a. Schlage L9000 series
b. Corbin-Russwin ML2000 series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
2. Provide indicators with messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
5. 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.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
8. 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.

a. Lever Design: Best 14H

2.09 CYLINDRICAL LOCKSETS

A. Product:

1. Grade 1 cylindrical locksets: Basis of Design – Best 9K series.

2.10 DEADBOLTS:

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Best T series

2. Acceptable Manufacturers and Products:

    a. Schlage B series
    b. Dormakaba D800 series

B. Requirements:

1. Provide deadbolt series conforming to ANSI/BHMA A156.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide deadbolts with standard 2-3/4 inches (70 mm) backset. Provide 2-3/8 inches (60 mm) where noted or if door or frame detail requires. Provide deadbolt with full 1-inch (25 mm) throw, constructed of steel alloy.
4. Provide manufacturer’s standard strike.

2.11 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

    a. Best 2000 series

2. Acceptable Manufacturers and Products:

    a. Von Duprin 99 series
    b. Corbin Russwin PED5000 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer’s approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.

13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Tornado Applications: Provide assembly UL approved to ICC 500-2014 guidelines for outswing single or pair doors. Must be used with tested and approved door and frame system.
17. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.12 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Best RPSMLR2 series

2. Acceptable Manufacturers and Products:

   a. Schlage/Von Duprin PS900 Series
   b. Securitron BPS series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:

   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.
   h. Cover mounted AC Input indication.
   i. Tested and certified to meet UL294.
   j. NEMA 1 enclosure.
   k. Hinged cover w/lock down screws.
   l. High voltage protective cover.

2.13 CYLINDERS & KEYING

A. Manufacturers:

1. Scheduled Manufacturer and Product:

   a. Schlage Primus – match owner’s existing

1) Locations: Exterior doors, main administration doors, technology rooms, and other doors as indicated in hardware sets.

b. Schlage Everest – match owner's existing
1) Locations: Interior doors, to include all classrooms and storage rooms, and other doors as indicated in hardware sets.

2. Acceptable Manufacturers and Products:

a. No Substitute

B. Requirements:

1. Provide required cylinders and uncombinated large-format interchangeable cores to be keyed into Owner's existing keying system by Owner's locksmith, complying with guidelines in ANSI/BHMA A156.28; Cylinder face finished to match lockset, manufacturer's series as indicated.

C. Construction Keying:

1. Replaceable Construction Cores

a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
1) 3 construction control keys
2) 12 construction change (day) keys.

b. Contractor will replace temporary construction cores with permanent cores.

2.14 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Best EHD9000 series

2. Acceptable Manufacturers and Products:

a. LCN 4040XP series
b. Dormakaba 8900 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 5/8 inch (16 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.

6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.15 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Assa Abloy SW200

2. Acceptable Manufacturers and Products:

a. LCN 4600 series
b. Besam Power Swing series

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide drop plates, brackets, and adapters for arms as required for details.
6. Provide hard-wired actuator switches and receivers for operation as specified.
7. Provide weather-resistant actuators at exterior applications.
8. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
9. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.16 ACTUATORS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Best

2. Acceptable Manufacturers:

    a. LCN
    b. SDC

B. Requirements:

1. Provide actuators as specified in the hardware groups.

2.17 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Trimco

2. Acceptable Manufacturers:

    a. Ives
    b. Rockwood

B. Requirements:

1. Provide push plates, push bars, pull plates, and pulls with diameter and length as scheduled.

2.18 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Trimco

2. Acceptable Manufacturers:

    a. Ives
    b. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Dormakaba

2. Acceptable Manufacturers:

a. Glynn-Johnson
b. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.20 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Trimco

2. Acceptable Manufacturers:

a. Ives
b. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.21 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. National Guard

2. Acceptable Manufacturers:

a. Pemko
b. Zero International

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.22 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Dormakaba

2. Acceptable Manufacturers:

a. Schlage
b. Securitron

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.23 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing doors and frames for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

H. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.

I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect's opening number.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 FIELD QUALITY CONTROL

A. Inspection and Testing:

1. Provide functional testing and inspection of fire door assemblies by a qualified person in accordance with NFPA 80.

    a. Schedule fire door assembly inspection within 90 days of Substantial Completion of the Project.
    b. Submit a signed, written final report as specified in Paragraph 1.03.E.1.
    c. Correct all deficiencies and schedule a reinspection of fire door assemblies noted as deficient on the inspection report.
    d. Inspector to reinspect fire door assemblies after repairs are made.

2. Provide inspection of required egress door assemblies by a qualified person in accordance with NFPA 101.

    a. Schedule egress door assembly inspection within 90 days of Substantial Completion of the Project for the required openings.
    b. Submit a signed, written final report as specified in Paragraph 1.03.E.2.
    c. Correct all deficiencies and schedule a reinspection of egress door assemblies noted as deficient on the inspection report.

d. Inspector to reinspect required egress door assemblies after repairs are made.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer’s instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units, Standard Glazing.

C. Plastic films.

D. Glazing compounds.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2026.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

E. ASTM C1036 - Standard Specification for Flat Glass; 2025.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

L. GANA (GM) - GANA Glazing Manual; 2022.

M. GANA (SM) - GANA Sealant Manual; 2008.

N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

O. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2026.

R. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch (___ by ___ mm) in size of glass units.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), IGMA TM-3000, and NGA (LGRM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
1. GGI - General Glass International: www.generalglass.com/#sle.
2. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
3. Viracon, Inc: www.viracon.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Float Glass Manufacturers:
1. Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC: www.guardianglass.com/#sle.
3. Pilkington North America Inc: www.pilkington.com/na/#sle.
4. Saint Gobain North America; _____: www.saint-gobain.com/#sle.
5. Oldcastle; www.obe.com.
6. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

C. Spandrel Glass Manufacturers:
1. match glazing unit manufacturer.

D. Plastic Films Manufacturers: commercial decorative lines
1. 3M Window Film: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
   a. Basis of Design: SX-3140 Dusted Crystal.
2. Avery Dennison; Decorative Plastic Films: www.averydennison.com/#sle.

3. Flexvue Films; patterns: www.flexvuefilms.com/#sle.
4. LLumar, an Eastman Chemical Company; LLumar: www.llumar.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Aluminum.
   5. Edge Seal:
      a. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

D. GL1 Insulating Glass Units: Vision glass, double glazed. basis of design is SOLARBAN 70 Insulated Glazing Unit. Intent is for CLEAR color.

1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch (25.4 mm).
6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.34, nominal.
7. Visible Light Transmittance (VLT): 70 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 0.21, nominal.

2.05 GLAZING UNITS

A. Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

B. Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Sliding glass doors.
      c. Shower and bathtub enclosures and doors.
      d. Glazed sidelights to doors, except in fire-rated walls and partitions.
      e. Glazed view windows and panels in partitions enclosing athletic activity rooms, except in fire-rated walls and partitions.
      f. Other locations required by applicable federal, state, and local codes and regulations.
      g. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

2.06 GLAZING COMPOUNDS

A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 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.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Metal channel ceiling framing.
D. Resilient sound isolation clips.
E. Acoustic insulation.
F. Cementitious backing board.
G. Gypsum wallboard.
H. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Structural steel stud framing.
B. Section 092216 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2024.
B. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.
C. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
D. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2020.
E. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
F. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
G. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
H. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
J. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2025.
K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
L. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
M. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
N. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
O. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

P. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.

Q. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

R. 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.

S. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

T. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2025.

U. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2025.

V. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

W. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2024.

X. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

Y. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

Z. ASTM E413 - Classification for Rating Sound Insulation; 2022.

AA. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

BB. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2025.

CC. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Sound-Rated: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of as indicated in partition schedule calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of as indicated in partition schedule calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

E. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions in accordance with ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
   1. Local authorities having jurisdiction.

F. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216 complying with the following:
   1. ICC-ES Evaluation Report No. _____.

G. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Material and Product Requirements Criteria: AISI S201.

B. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
   1. Structural Grade: As required to meet design criteria.
   2. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.

C. Nonstructural Steel Framing for Application of Gypsum Board: See Section 092216.

D. Structural Steel Framing for Application of Gypsum Board: See Section 054000.

E. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
   1. Studs: C-shaped with knurled or embossed faces.
   2. Paired Studs for Sound-Rated Assemblies: Engineered single-piece assemblies comprised of paired studs coupled by sound isolators, designed to replace conventional side-by-side, parallel, double-wall partition framing.
      a. Widths: As indicated on drawings.
   3. Runners: U shaped, sized to match studs.
   4. Ceiling Channels: C-shaped.
   5. Flexible Track: Flexible framing consisting of adjustable leg straps and pivoting, hinged track brackets designed to provide curved framing assemblies of varying radii.
   6. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
   7. Furring Members: Zee-shaped sections, minimum depth of 1 inch (25 mm).
   8. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation performance of wall and floor-ceiling assemblies.
   9. Sill Plate Isolation Pads: Acoustical separation between sole plate and subfloor.

F. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

G. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.

2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.

H. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

I. Preformed Top Track Firestop Seal:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

J. Preformed Top of Wall Firestop Gasket:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

K. Preformed Bottom of Wall Firestop Track Seal:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated bottom of partition joint systems indicated on drawings.

L. Non-structural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

2.03 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Thickness:
a. Vertical Surfaces: 5/8 inch (16 mm). TYPE X
b. Ceilings: 5/8 inch (16 mm). TYPE X

B. Abuse Resistant Wallboard:
1. Application: where indicated on drawings.
2. Surface Abrasion: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
6. Type: Fire-resistance-rated Type X, UL or WH listed.
7. Thickness: 5/8 inch (16 mm).
8. Edges: Tapered.

C. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in all areas
2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
a. Thickness: 5/8 inch (16 mm).

D. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. Type X Thickness: 5/8 inch (16 mm).
3. Edges: Tapered.

E. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (600 mm) wide, beveled long edges, ends square cut.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness as required for STC.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. 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.

D. Decorative Metal Trim:
1. Material: Extruded aluminum alloy 6063-T5 temper.
2. Finish: Anodized, clear.
3. Type: Profile as selected from manufacturer's standard range.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Joint Compound: Drying type, vinyl-based, ready-mixed.
4. Joint Compound: Setting type, field-mixed.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

H. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 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 (600 mm) 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.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.

F. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

G. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.

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. 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.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

E. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board.

H. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.
   2. Double-Layer Application: Install base layer using screws. Install face layer using screws.

I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
   2. At exterior soffits, not more than 30 feet (10 meters) apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

E. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.

3.07 JOINT TREATMENT

A. 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.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

C. 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.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.09 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation: Acoustic insulation.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2024.

B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2025.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

G. 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.

H. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings:
   1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
   2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Manufacturer Reports: Include research reports indicating compliance with applicable building codes.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Fire-Resistance-Rated Assemblies: Comply with applicable code and as indicated on drawings.

B. Firestopping: Materials meeting requirements necessary to maintain rating of penetrated assembly.
   1. Fire Ratings: See drawings for required systems and ratings.

C. Loadbearing Studs: As specified in Section 054000.

D. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220.
   1. Structural Grade: As required to meet design criteria.

E. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
   1. Studs: C-shaped.
      a. Products:
         1) CEMCO; CT Studs: www.cemcosteel.com/#sle.
         2) ClarkDietrich; ProSTUD: www.clarkdietrich.com/#sle.
         3) MRI Steel Framing; MRI Traditional - Non-Structural: www.mristeelframing.com/#sle.
   2. Paired Studs for Sound-Rated Assemblies: Engineered single-piece assemblies comprised of paired studs coupled by sound isolators, designed to replace conventional side-by-side, parallel, double-wall partition framing.
   3. Runners: U-shaped, sized to match studs.
   4. Ceiling Channels: U-shaped.
   5. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
   6. Furring: Z-shaped sections, minimum depth of 1 inch (25 mm).
   7. Resilient Furring Channels: Single or double leg configuration; 1/2 inch (12 mm) channel depth.
   8. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attach to framing; improve noise isolation for areas between gypsum board assemblies and adjacent sources of noise.

F. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

G. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code when evaluated in accordance with AISI S100.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50.

H. Preformed Top Track Firestop Seal:
   1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

I. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
   3. Bracing and Bridging: ASTM A653/A653M G90 (Z275) galvanized steel; for lateral bracing of wall studs with slots for engaging on-module studs.
   4. Flexible Wood Backing: Fire-retardant-treated wood with sheet steel connectors.
   5. Fasteners: ASTM C1002 self-piercing self-tapping screws.

6. Anchorage Devices: Powder actuated.
7. Acoustic Insulation: See Section 072100.
8. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

2.02 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members 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 existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Install structural members and connections in accordance with ASTM C1007.

B. Extend partition framing to structure where indicated and to ceiling in other locations.

C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

E. Fire-Resistance-Rated Construction: Install framing and accessories in accordance with requirements of fire-resistance-rated assembly and to GA-600 requirements.

F. Align and secure top and bottom runners at 24 inches (600 mm) on center.

G. At partitions indicated with an acoustic rating:
   1. Place one bead of acoustic sealant between runners and substrate , studs and adjacent construction.

H. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

I. Align stud web openings horizontally.

J. Secure studs to tracks using crimping method. Do not weld.

K. Stud splicing is not permissible.

L. Fabricate corners using a minimum of three studs.

M. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

N. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

O. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and opening frames.

P. Sound Isolation Clips: Mechanically attach to framing or structure with fasteners recommended by clip manufacturer. Install at spacing indicated on drawings.

Q. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches (150 mm).

3.03 CEILING AND SOFFIT FRAMING

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inches (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each opening.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 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.

1.04 SUBMITTALS

A. See Section 013000 - 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 ____ by ____ inch (____ by ____ mm)illustrating material and finish of acoustical units.

E. Manufacturer's qualification statement.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels - wood, acoustic, and metal: Refer to drawings for basis of design. Approved manufacturers are as follows:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. USG Corporation: www.usg.com/#sle.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Class A in accordance with ASTM E84.

B. Systems Located Outside Building Envelope:
   1. Accommodate wind and suction loads and wind uplift without damage in accordance with applicable code.
   2. Thermal Resistance R-value (RSI-value): _____ (_____) total, with insulation installed.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Tiles, ACT-2: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type A.
      a. Form: A1.2, wet formed.
      b. Pattern: D - fissured.
   2. Size: 24 by 48 inches (610 by 1219 mm).
   3. Thickness: 3/4 inch (19 mm).
   4. Light Reflectance: 0.82 percent, in accordance with ASTM E1264.
   5. Noise Reduction Coefficient (NRC) Range: 0.70 to .075, in accordance with ASTM E1264.
   6. Tile Edge: Square.
      a. Joint: Kerfed and rabbeted.
   7. Color: White.
   8. Suspension System: Exposed grid.
   9. Suspension System: Concealed.
   10. Products:
      a. Armstrong World Industries, Inc; Fine Fissured: www.armstrongceilings.com/#sle.
         1) Basis of Design: 1714 School Zone, Fine Fissured.

2.04 SUSPENSION SYSTEMS

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.
      b. Aluminum Grid: Aluminum sheet, ASTM B209/B209M.
      c. Stainless Steel Grid: ASTM A666/A666M, Type 304.

B. Exposed Suspension System: Hot-dip galvanized steel grid with steel cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch (24 mm) face width.

3. Finish: Baked enamel.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Face sleeve.

F. Wood Veneer Panel Safety Clips: Galvanized 1-9/16 by 5-1/2 inch (40 by 139 mm) bent sheet metal clips screw anchored to back of adjacent panels and spanning over top of suspended tee grid.
   1. Wire Ties: No. 12 galvanized wire.

G. Wood Veneer Perimeter Trim: Field cut wood veneer panels to match acoustic ceiling panels.

H. Perimeter Moldings: Same metal and finish as grid.
   1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
   2. Shadow Molding: Shaped to create a perimeter reveal.
   3. Channel Molding: U-shaped, for hold-down type installations.
   4. Gaskets For Perimeter Moldings: Closed-cell foam, factory-applied to molding.

I. Metal Edge Trim for Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
   1. Trim Height: 6 inches (152 mm).
   2. Finish: Baked enamel.
   3. Color: White.

J. 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.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

D. 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.

E. 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.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

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. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

G. Install safety clips on wood veneer panels 2 inches (51 mm) from outside edge of panel and at 24 inches (610 mm) on center.

H. Install wood veneer trim using aluminum L angle to attach to suspended grid system as required for application.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. Clean surfaces.

B. Replace damaged or abraded components.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Resilient stair accessories.

E. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - 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 D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; 1998 (Reapproved 2023).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.

E. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).

F. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

G. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2025).

H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

I. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

J. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

K. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit two samples, ___ by ___ inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 FOR ALL PRODUCTS REFER TO DRAWINGS FOR BASIS OF DESIGN. APPROVED ALTERNATE MANUFACTURERS LISTED BELOW PROVIDED ALTERNATE MANUFACTURERS MEET THE PERFORMANCE, MATERIAL CHARACTERISTICS, AND GENERAL STYLE OF THE BASIS OF DESIGN.

2.02 TILE FLOORING

A. Vinyl Tile - LVT-1: Printed film type, with transparent or translucent wear layer.
   1. Manufacturers:
      a. Refer to drawings.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   4. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329; certified in accordance with UL 2824.
   5. Plank Tile Size: 6 by 48 inch (152 by 1219 mm).
   6. Wear Layer Thickness: 0.020 inch (0.50 mm).
   7. Total Thickness: 0.20 inch (5.0 mm).
   8. Color: As indicated on drawings.

2.03 STAIR COVERING

A. Stair Treads with Integral Risers: Rubber; full height of riser, full width and depth of tread in one piece; tapered thickness.
   1. Manufacturers:
      a. Mannington Commercial; _____: www.manningtoncommercial.com#sle.
      b. Roppe Corporation; _____: www.roppe.com/#sle.
      c. Tarkett Flooring: www.tarkett.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.

3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
4. Nosing: Square.
5. Striping: 2 inch (24 mm) wide contrasting color abrasive strips.
6. Tread Texture: Raised.
7. Color: To be selected by Architect from manufacturer's full range.

2.04 RESILIENT BASE

A. Resilient Base - RB-1: ASTM F1861, Type TP, rubber, thermoplastic; style as scheduled.
1. Height: 4 inches (100 mm).
2. Thickness: 0.125 inch (3.2 mm).
3. Finish: Satin.
4. Color: As indicated on drawings.
5. Accessories: Premolded external corners and internal corners.

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test as Follows:
a. Alkalinity (pH): ASTM F710.
b. Internal Relative Humidity: ASTM F2170.
c. Moisture Vapor Emission: ASTM F1869.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

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. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 096566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied polyurethane flooring over rubberized base mat.

B. Painted game lines.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

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 F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2024.

E. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification; 2006.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

E. Test Reports: Submit test reports showing compliance with ASTM F2772.

F. Manufacturer's Instructions: Indicate standard and special installation procedures.

G. Manufacturer's qualification statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F (21 to 35 degrees C) for not less than 48 hours before the beginning of

installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F (10 degrees C) or to go above 100 degrees F (38 degrees C).

PART 2 PRODUCTS

2.01 FLUID-APPLIED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Action Floor Systems; Herculan MF: www.actionfloors.com/#sle.
   2. Connor Sports Flooring; _____: www.connorfloor.com/#sle.
   3. Robbins Sports Surfaces; _____: www.robbinsfloor.com/#sle.

B. Polyurethane Flooring Over Rubberized Base Mat, Type SG-1:
   1. Comply with testing requirements according to DIN EN 14904 for type application indicated.
   2. Basis of Design: Robbins Pulastic Classic 110.
   3. Total System Thickness: Minimum 7/16 inch (11.0 mm); with minimum 0.07 inch (1.8 mm) polyurethane.
   4. Base Mat: Prefabricated rubber mat of recycled rubber granules in polyurethane binder.
   5. Sealer: Manufacturer's standard two-component polyurethane compound designed to seal base mat before application of resin topcoat.
   6. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, zero mercury formulation, with properties as follows:
      a. Tensile strength: Minimum 1000 psi (6.9 MPa), per ASTM D412.
      b. Durometer Hardness, Type A: Minimum of 70, when tested in accordance with ASTM D2240.
      c. Ultimate Elongation: Minimum 100 percent, per ASTM D412.
   7. Finish: Manufacturer's standard pigmented two-component polyurethane topcoat, matte finish, in color as selected from manufacturer's standard range.

C. Polyurethane Flooring Over Rubberized Base Mat, Type SG-2:
   1. Comply with testing requirements according to DIN EN 14904 for type application indicated.
   2. Basis of Design: Robbins Intense.
   3. Total System Thickness: Minimum 7/16 inch (11.0 mm); with minimum 0.07 inch (1.8 mm) polyurethane.
   4. Base Mat: Prefabricated rubber mat of recycled rubber granules in polyurethane binder.
   5. Sealer: Manufacturer's standard two-component polyurethane compound designed to seal base mat before application of resin topcoat.
   6. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, zero mercury formulation, with properties as follows:
   7. Finish: Manufacturer's standard pigmented two-component polyurethane topcoat, matte finish, in color as selected from manufacturer's standard range.

D. Game Lines: Manufacturer's standard pigmented polyurethane paint.
   1. Colors: As selected by Architect.

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. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius (1/1000).

C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Fluid-Applied 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 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.03 SUBMITTALS

A. See Section 013000 - 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. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tile Carpeting, Type WOC-1: Fusion bonded, manufactured in one color dye lot. Refer to drawings for size, pattern, and manufactuer of tile.
   1. Basis of Design Product: "All Access Portal Tile - Ebony 34500 manufactured by Shaw Contract.
   2. Size: 24 inches by 24 inches.

2.02 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, Black color.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove existing carpet tile.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. 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. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise 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-coated stainless steel, zinc, and lead.
7. Marble, granite, slate, and other natural stones.
8. Floors, unless specifically indicated.
9. Ceramic and other types of tiles.
10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
11. Glass.
12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.06 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, 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

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 paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions. All paints shall be the highest commercial grade available from the manufacturer.

B. Paints:
1. Pittsburgh Paints: www.pittsburghpaintsco.com/#sle.
2. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
3. Benjamin Moore.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
1. Provide paints and finishes 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. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes 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.
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.

C. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Semi-gloss: Two coats of latex enamel; ____.

B. Paint CE-OP-3L - Masonry/Concrete, Opaque, Latex, 3 Coat:
   1. One coat of block filler.
   2. Semi-gloss: Two coats of latex enamel; ____.

C. Paint GE-OP-3L - Exterior Gypsum Board and Exterior Plaster, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Flat: Two coats of latex; ____.

D. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer.
   2. Semi-gloss: Two coats of alkyd enamel; ____.

E. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Two coats of alkyd enamel; ____.

F. Paint E-Pav - Pavement Marking Paint:
   1. Yellow: One coat, with reflective particles; _____.
   2. White: One coat, with reflective particles; _____.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali-Resistant Water-Based Primer; MPI #3.
   2. Interior/Exterior Latex Block Filler; MPI #4.
   3. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
   4. Stain Blocking Primer, Water-Based; MPI #137.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

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. Exterior Plaster and Stucco: 12 percent.
   2. Fiber Cement Siding: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to 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 for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.

G. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

I. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.

J. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

L. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

M. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

N. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: 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. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

O. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

P. 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. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

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. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise 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, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
   10. Glass.
   11. Acoustical materials, unless specifically indicated.
   12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 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, 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD 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 materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions. Products provided shall be the highest commercial grade product from manufacturer.

B. Paints:
   1. Pittsburgh Paints: www.pittsburghpaintsco.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Benjamin Moore.

C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes 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. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes 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.
   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.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

E. Approved Manufacturers:
   1. Refer to drawings for colors and base manufacturer. Acceptable Manufacturers (if colors can be matched) are as follows:
      a. Sherwin Williams
      b. Benjamin Moore
      c. PPG Commercial Paints

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, galvanized piping, and _____.
   1. Shop primer by others.
   2. One top coat _____.
   3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
   4. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen at all locations.

B. Paint I-OP-FL - Concrete and Wood Floors to be Painted.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Latex Floor Paint, Low Gloss; MPI #60.

C. Paint I-TR-C - Transparent Finish on Concrete Floors.
   1. 1 coat stain.
   2. Stain: Semi-Transparent Stain for Concrete Floors; MPI #58.
   3. Sealer: Water Based Sealer for Concrete Floors; MPI #99.
   4. Sealer Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.

D. Paint I-OP-AF - Game Line Marking Paint for Wood Athletic Floors.
   1. Water-Based Paint:

E. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:

1. One coat of latex primer sealer.
2. Semi-gloss: Two coats of latex enamel; _____.

F. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:
1. One coat of block filler.
2. Eggshell: Two coats of latex enamel; ____.

G. Paint MI-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
2. Semi-gloss: Two coats of alkyd enamel; ____.

H. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with alkyd primer.
2. Semi-gloss: Two coats of alkyd enamel; ____.

I. Paint CI-OP-3Af - Concrete/Masonry, Alkyd Floor Enamel, 3 Coat:
1. One coat of alkali-resistant primer.
2. Gloss: Two coats of alkyd floor enamel; ____.

J. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of alkyd primer sealer.
2. Eggshell: Two coats of latex enamel; _____.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer; MPI #3.
2. Interior/Exterior Latex Block Filler; MPI #4.
3. Concrete Floor Primer, Waterborne.
4. Interior Latex Primer Sealer; MPI #50.
5. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
6. Stain Blocking Primer, Water Based; MPI #137 or #172.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

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 is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to 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 repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

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. Acoustical Panel Ceilings:
   1. Pretreat ceiling water stains according to manufacturer's written instructions.
   2. Pretreat tiles saturated with grease or nicotine according to manufacturer's written instructions.

H. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.

I. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
   2. Prepare surface as recommended by top coat manufacturer.

J. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

K. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

L. Galvanized Surfaces:

M. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

N. 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.

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 written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Diaper changing stations.

E. Utility room accessories.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

F. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2023.

G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

H. ASTM C1036 - Standard Specification for Flat Glass; 2025.

I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

J. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

K. ASTM D4802 - Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet; 2016 (Reapproved 2024).

L. ASTM D5047 - Standard Specification for Polyethylene Terephthalate Film and Sheeting; 2017 (Reapproved 2023).

M. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. American Specialties, Inc: www.americanspecialties.com/#sle.
2. Bradley Corporation: www.bradleycorp.com/#sle.
3. Kimberly-Clark Corporation; Kimberly-Clark Professional ICON Collection: www.kcprofessional.com/#sle.
4. Bobrick, Inc.: www.bobrick.com.
5. Substitutions: Section 016000 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
2. Substitutions: Section 016000 - Product Requirements.

C. Electric Hand/Hair Dryers:
1. Owner provided, contractor installed. Model is Excel Dryer Inc. Model No. XL-GR-1519818.

D. Diaper Changing Stations:
1. American Specialties, Inc; 9012: www.americanspecialties.com/#sle.
2. Bradley Corporation; 963: www.bradleycorp.com/#sle.
3. Koala Kare Products; KB208: www.koalabear.com/#sle.
4. Substitutions: 016000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

E. Zinc Alloy: Die cast, ASTM B86.

F. Acrylic Plastic Sheet: ASTM D4802.

G. PETG Plastic Sheet: ASTM D5047.

H. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

I. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

J. Adhesive: Two component epoxy type, waterproof.

K. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

L. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

E. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

F. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

G. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.
   1. Attached Purse Shelf: 0.03 inch (0.8 mm) satin finished stainless steel, with rolled or formed edge at front.

B. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: 24x36.
   3. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   4. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.

C. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
      b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.
      d. Provide concealed fasteners with eschutcheon plates.

D. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
   1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
   2. Size: 36 by 72 inches (914 by 1830 mm), hemmed edges.
   3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
   4. Color: White.
   5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
   2. Size: ADA Standards compliant.

D. Towel Pin: Stainless steel, 3 inch (75 mm) extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Products:
      a. Basis of Design: ASI: 7301-S.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
   3. Construction: 1/8 inch (3.2 mm) flexible PVC.

4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.07 DIAPER CHANGING STATIONS

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Material: Polyethylene.
2. Mounting: Surface.
3. Minimum Rated Load: 250 pounds (113.4 kg).

2.08 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
1. Hooks: Two, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
3. Length: 36 inches (900 mm).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C.
   2. Size: 5 lb (2.27 kg).
   3. Finish: Baked polyester powder coat; color as selected by Architect.
   4. Temperature Range: Minus 65 to 120 degrees F (Minus 54 to 49 degrees C).

2.02 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire-resistance rating of walls where cabinet installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 20-gauge, 0.036-inch (0.9 mm) thick base metal.

C. Fire-Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8-inch (16 mm) thick fire barrier material.

D. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Trim: Flat square edge, with 2-inch (51 mm) wide face.

E. Door: 20-gauge, 0.036-inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180-degree opening with two butt hinges.

F. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

J. Finish of Cabinet Interior: White colored enamel.

2.03 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 101423.16
ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes room-identification signs that are directly attached to the building.

B. Related Requirements:

1. Section 101416 "Plaques" for one-piece, solid metal signs, with or without frames, that are used for high-end room-identification.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Room-Identification Signs: Full-size Sample.
2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
3. Exposed Accessories: Full-size Sample of each accessory type.

4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or Specifications.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to be included in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign: Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ACE Sign Systems, Inc.
    b. ASI Sign Systems, Inc
    c. Ellet Neon & Plastic Signs
    d. Inpro Corporation

2. Laminated-Sheet Sign: Sandblasted polymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.

    a. Composite-Sheet Thickness: **0.125 inch**.
    b. Surface-Applied Graphics: Applied paint.
    c. Subsurface Graphics: Reverse etch image.
    d. Color(s): Two contrasting colors for background and text/pictograms/braille to be selected by Architect from manufacturer's full range of color options.
    e. Size: as indicated in schedule.

3. Sign-Panel Perimeter: Finish edges smooth.

    a. Corner Condition in Elevation: Square.

4. Mounting: Manufacturer's standard method for substrates indicated with adhesive or double-back tape and adhesive.
5. Text and Typeface: Accessible raised characters and Braille.

B. Interior Panel Sign Schedule

1. “WOMEN”.

    a. Women’s restrooms 103
    b. Size: approximately 9”x9”.
    c. Graphics: Woman graphic with universal ADA symbol.

2. “MEN”.

    a. Men’s restrooms 102
    b. Size: approximately 9”x9”.
    c. Graphics: Man graphic with universal ADA symbol.

3. “VISITOR LOCKER ROOM”.

    a. Visitor Locker Room 108.
    b. Size: approximately 9”x9”.
    c. Graphics: universal ADA symbol.

4. “HOME LOCKER ROOM”

    a. Home Locker room 109.
    b. Size: approximately 9”x9”.
    c. Graphics: universal ADA symbol.

5. “MEZZANINE ACCESS”.

    a. Mezzanine Access stair – mount in vestibule 107.
    b. Size: approximately 9”x9”.

6. “GYMNASIUM STORAGE”.

    a. Storage 106.
    b. Size: approximately 9”x9”.

7. “STORAGE”.

    a. Storage 111.
    b. Size: approximately 9”x9”.

8. “MECHANICAL 112”.

    a. Mechanical 112.
    b. Size: approximately 9”x9”.

9. “TRAINER”.

    a. Trainer 113.
    b. Size: approximately 9”x9”.

10. “EXIT”.

    a. Locations:
        1) Vestibule 100 (Mounted adjacent to interior vestibule doors on glass sidelite.)
        2) Corridor 110
        3) Vestibule 107

    b. Size: approximately 3” X 7”.
    c. Provide matching blank and black back-plate where mounted to glass at main entry vestibule.

2.3 SIGN MATERIALS

A. Aluminum Sheet and Plate: **ASTM B209**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: **ASTM B221**, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Sign Mounting Fasteners:

    a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.

B. Adhesive: As recommended by sign manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, **0.045 inch** thick, with adhesive on both sides.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls as indicated on Drawings, and, according to the accessibility standard.

1. Prior to installing signage, confirm specific locations with the architect and Owner.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
    c. Doors: install signage on doors where indicated with tamper resistant stainless steel pan head screws.
2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.2 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423.16

SECTION 102113.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

1.02 REFERENCE STANDARDS

1.03 ADMINISTRATIVE REQUIREMENTS

1.04 SUBMITTALS

A. Product Data: Provide data on panel construction, hardware, and accessories.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Samples: Submit two samples of partition panels, ____by____ inch (____by____ mm) in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
1. ASI Accurate Partitions; _____: www.asi-accuratepartitions.com/#sle.
2. Hadrian; Hadrian - Standard Series - Plastic: www.hadrian-inc.com/#sle.
3. Basis of Design: Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.

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: Black.
2. Panels:
   a. Thickness: 1 inch (25 mm).
   b. Height: 55 inch (1397 mm).
3. Pilasters:
   a. Thickness: 1 inch (25 mm).
4. 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 (76 mm) 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.

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.

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: Thumbturn 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.
1. Coordinate blocking locations in stud walls.

B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 116623
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor sleeves for net and goal posts.

C. Wall mounted protection pads.

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections.

B. Section 134919 - METAL BUILDING SYSTEMS for building superstructure.

C. Division 23 specifications for electrical requirements.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

B. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

F. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.

E. Operating and maintenance data for each operating equipment item.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified with minimum 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 10 year manufacturer warranty for basketball backstops and supporting structure including but not limited to accessories, motors and related equipment..

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. Porter Athletic: 2802 Gemini Court, Champaign, IL 61822. www.gillporter.com. 888-277-7778.
   2. Draper, Inc.: 411 South Pearl St. Spiceland, Indiana 47385. www.draperinc.com. 800-238-7999.
   3. IPI by Bison, Inc; _____: www.ipibybison.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:

C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL

A. Basketball System: Backstop assembly, backboard, and goal.

B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
   1. Framing: Center strut; forward folding framing.
   2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
   3. Height Adjuster: Raises or lowers assembly by 2 feet (610 mm) to adjust goal height.
      a. Height Control System: Manual winch.
   4. Manufacturer shall verify conditions and the proposed height of the structure. Coordinate backstop supporting structure design with the proposed structure. Provide design loads

and specific locations to the pre-engineered metal building designer. Coordinate bracket or clamp type for the support of the basketball backstops with the pre-engineered metal building designer.

5. Framing Color: Manufacturer's standard: black..

C. Backboards:
1. Install owner provided backboards and goals. Backboards are by BSN Sports. Item No. NSPHG, Model OFX4235E-COLO-Black. Contact Mckenzie Breymier for additional information and for coordination: mbreymier@bsnsports.com.
2. Mounting brackets to the backstop supporting frame will be provided by the Owner.

2.04 FLOOR-MOUNTED EQUIPMENT

A. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
1. Latch Cover: Brass, round.
2. Sleeve: Aluminum.
3. Round Pole Diameter: 3 inches (__ mm).
a. Confirm equipment type and diameter of sleeves with Owner.
4. Depth of Sleeve: 9 inches (230 mm) from floor surface to bottom, including latch cover.

2.05 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
1. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
a. Color: As selected from manufacturer's standard range.
b. Texture: Embossed leather-look.
c. Fabric Weight: 14 oz/sq yd (0.52 kg/sq m), minimum.
2. Foam: Soft, urethane or polyurethane, with 3.5 pcf (55 kg/cu m) nominal density.
3. Foam Thickness: 1-1/2 inches (38 mm).
4. Backing Board: Plywood.
5. Manufacturers:
a. ADP Lemco, Inc: www.adplemco.com/#sle.
b. Draper, Inc: www.draperinc.com/#sle.
c. Grand Slam Safety, LLC: www.grandslamsafety.com/#sle.
d. IPI by Bison, Inc: www.ipibybison.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:

C. Graphics: apply graphics to pads where shown. Artwork shall be provided by the Owner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2023.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch (1.2 mm) nominal thickness.
      a. Manufacturers:
         1) Arborite: www.arborite.com/#sle.
         2) Formica Corporation: www.formica.com/#sle.
         3) Wilsonart: www.wilsonart.com/#sle.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: Molded PVC edge with T-spline, sized to completely cover edge of panel.
   3. Back and End Splashes: Same material, same construction.

2.02 MATERIALS

A. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.

B. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

C. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

D. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

E. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 ACCESSORIES

A. Fixed Top-Mounted Countertop Support Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
   3. Color: Black.

2.04 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches (102 mm), unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

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. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal Framing Components

B. Metal Liner Panels and Trim

C. Metal Roof Panels and Trim

D. Metal Building Accessories

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-place concrete

B. Section 074213 – Metal Wall Panels.

C. Section 09 90 00 - Painting: Finish painting of primed steel surfaces.

1.3 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC):
   1. 360, Specification for Structural Steel Buildings.
   2. RCSC, Specification for Structural Joints Using High Strength Bolts.
   3. Design Guide 3, Serviceability Design Considerations for Steel Buildings

B. American Iron and Steel Institute (AISI):
   1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members

C. American Welding Society (AWS):
   1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.
   2. AWS D1.3 / D1.3M – Structural Welding Code – Sheet Steel

D. Association for Iron & Steel Technology (AISE):
   1. AISE 13 – Specifications for Design and Construction of Mill Buildings.

E. ASTM International (ASTM):
   1. A36 – Standard Specification for Carbon Structural Steel
   2. A123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   3. A354 – Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
   4. A475 – Specification for Zinc-Coated Steel Wire Strand

5. A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
6. A529 – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
7. A536 – Standard Specification for Ductile Iron Castings.
8. A563 – Specification for Carbon and Alloy Steel Nuts
9. A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
10. A653 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
11. A792 / A792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
12. A992 – Standard Specification for Structural Steel Shapes.
13. A1011 – 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.
14. A1039 – Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process
15. D2244–Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
16. D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
17. E96 / E96M – Standard Test Methods for Water Vapor Transmission of Materials.
18. E108 - Spread-of Flame Testing: Class 1A Rating.
19. E283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
20. E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
21. E1592 – Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
22. E1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
23. E1680 – Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
24. E2140 – Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
25. F436 – Specification for Hardened Steel Washers
26. F1145 – Specification for Turnbuckles, Swaged, Welded, Forged
27. F1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
28. F3125 – Standard Specification for High Strength Structural Bolts

F. IAS – International Accreditation Service

G. SJI – Steel Joist Institute

H. Metal Building Manufacturers Association (MBMA):
   1. MBMA Metal Building Systems Manual

I. Underwriters Laboratories (UL):
   1. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies
   2. UL 790 – Standard Test Methods for Fire Tests of Roof Coverings
   3. UL 263 – Fire Tests of Building Construction and Materials

J. Cool Roof Rating Council (CRRC):
   1. CRRC-1 Standard, 2008.

2. Product Rating Program Manual for CRRC-1, October 2, 2024

1.4 DEFINITIONS

A. Metal Building System: A building system that will employ:
- Either a continuous or simple-span ‘Z’ or ‘C’-shaped cold-formed purlins or open-web steel joists for support of the roof cladding.
- Either a continuous or simple-span ‘Z’ or ‘C’-shaped cold-formed girts or open-web steel joists for support of the steel wall cladding.
- Three-plate, built-up rigid space frames and/or cold-formed ‘C’ or hot-rolled I-shaped post-and-beam framing to support the roof and wall secondary members.
- All systems (cladding, roof and wall secondary, lateral primary framing, and longitudinal bracing) work together to provide resistance to vertical and lateral loading demands.

B. Gable Symmetrical: A continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (inset in the column line). The rafters may or may not have interior columns.

C. Lean-To (LTO): A building extension, which does not contain a ridge, but consists of one continuous slope from side to side. These units usually have the same roof slope and girt design as the building to which they are attached and supported by.

D. Roof Slope: Pitch expressed as inches of rise for each 12" of horizontal run.

E. Building Width: Measured from outside to outside of sidewall secondary structural member (girt).

F. Building Eave Height: A nominal dimension measured from the finished floor to top flange of eave strut.

G. Building Length: Measured from outside to outside of endwall secondary structural member.

H. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or other material handling systems.

I. Collateral Loads: The weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.

J. Dead Load: The actual weight of the building system (as provided by the metal building supplier) supported by a given member.

K. Floor Live Loads: Loads induced on a floor system by occupants of a building and their furniture, equipment, etc.

L. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and other movable or moving loads but not including wind, snow, seismic, crane, or dead loads.

M. Roof Snow Loads: Gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.

N. Seismic Loads: Loads acting in any direction on a structural system due to the action of an earthquake.

O. Wind Loads: The loads on a structure induced by the forces of wind blowing from any horizontal direction.

1.5 DESIGN REQUIREMENTS

A. Scope of work: All steel framing, girts, panels, flashings, gutters, downspouts and other components as required for a complete building. Other components to be provided by the Metal Building Systems Manufacturer shall include
   1. Roof insulation system.
   2. Wall insulation system
   3. Bar joists and steel decking for the mezzanine floor
      a. Note: design of the bar joists is a delegated design to the Metal Building Systems Manufacturer. Maximum depth of the bar joists being provided shall be 18”. Spacing and specific chord design is delegated to the Metal Building Systems Manufacturer. Decking gage and depth is delegated to the Metal Building Systems Manufacturer.
   4. Supplemental framing for basketball backstop support: .Design and provision of supplemental framing for support of the basketball backstops is a delegated design to the Metal Building Systems Manufacturer and shall be based on load information provided by the basketball backstop manufacturer. Coordination between the Metal Building System Manufacturer and the basketball backstop designer / manufacturer is required.
   5. The Metal Building Systems Manufacturer shall provide and design the steel beam and connections for the steel beams at the mezzanine level for support of the batting cage. The batting cage is a cable supported walk-draw type that will be provided and installed by others.

B. General
   1. The building manufacturer will use standards, specifications, recommendations, findings and/or interpretations of professionally-recognized groups such as AISC, AISI, AWS, ASTM, CSA, CWB, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. The Manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.
   2. Design structural mill sections and built-up plate sections in accordance with:
      a. (US) code-appropriate edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ANSI/AISC 360 ASD method.
   3. Cold-Formed steel structural members and panels will generally be designed in accordance with "Specifications for the Design of Cold-Formed Steel Structural Members", ANSI/AISI S-100.
   4. Design weldments per the following:
      a. Structural Welding
         1) (US) Design per AWS D1.1, “Structural Welding Code – Steel”, Latest Edition.
      b. Cold-Formed Welding
         1) (US) Design per AWS D1.3, “Structural Welding Code – Sheet Steel”, Latest Edition.

C. Design Code:
   1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
      a. Governing Building Code: Ohio Building Code.
      b. Year/Version: 2024.
      c. Occupancy Category: Assembly (Group A).

D. Design Loads:
   1. Risk Category of Building - III
   2. Dead Load – Weight of the building system as determined by manufacturer.
   3. Roof Live Load – 22 PSF.
   4. Collateral Load – 5 PSF.
   5. Snow Load:
      a. Ground Snow Load – 20 PSF.
      b. Exposure Factor– 1.0.
      c. Thermal Factor – 1.0.
      d. Roof Snow Load – 20 PSF.
   6. Wind Load:
      a. Basic Wind Speed – 114 MPH.
      b. Exposure Category– C.
   7. Seismic Load:
      a. Spectral response acceleration parameter at a period of 0.2 s (Ss) – 0.218.
      b. Spectral response acceleration parameter at a period of 1-sec. (S1) – 0.075.
      c. Site Class – D.
   8. Floor Load.
      a. Live Load – 100.
      b. Dead Load (Weight of Material by others).
      c. Collateral Load – 5 PSF.

E. General Serviceability Limits:
   1. Deflection Limits shall be in accordance with the applicable provisions of the Metal Building Systems Manual (MBMA), latest edition.
   2. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10 year mean-recurrence interval.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide complete erection drawings for the proper identification and assembly of all building components. Drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing, and sheeting, and accessory installation details.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.

F. Certifications: Shop drawings and design analysis shall bear the seal of a registered professional engineer upon request. Design analysis shall be on file and furnished by the manufacturer upon request.

G. Bill of Materials: Bills of material shall be furnished and shall include item weights.

H. Preventive Maintenance Manual.

I. Welder's Certifications: Certification of welder qualifications shall be furnished as specified by the Project Engineer.

J. Submit certification verifying that the metal roof system has been tested and approved by Underwriter’s Laboratory as Class 90.

K. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

1.7 QUALITY ASSURANCE

A. Manufacturer / Fabricator Qualifications:
   1. (US) All primary products specified in this section will be supplied by a single IAS AC 472 Accredited Manufacturer /Fabricator with a minimum of five (5) years’ experience.

B. Weldments/Welder/Weld Inspection Qualifications:
   1. (US) Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1, “Structural Welding Code – Steel”, latest edition. Welding inspection and welding inspector qualification for cold-formed steel shall be in accordance with AWS D1.3, “Structural Welding Code – Sheet Steel”, latest edition.

C. Erector Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

D. Design: Standard drawings and design analysis must bear the seal of a registered professional engineer. Design analysis must be on file and furnished by the manufacturer upon request.

1.8 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer’s instructions.

2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
3. Do not store materials directly on ground.
4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
5. Protect materials and finish during storage, handling, and installation to prevent damage.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside the manufacturer's absolute limits.

D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 WARRANTY

A. Building System Warranty
1. Furnish manufacturer's standard warranty for the metal building system, excluding paint.
2. The manufacturer shall warrant the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.
3. The liability under this warranty shall be limited to furnishing, but not dismantling or installing, necessary replacement material F.O.B. manufacturer's plant. In no event shall the manufacturer be liable for loss of profits, or other incidental, consequential, or special damages.

B. Standing Seam Roof Weathertightness Warranty (Optional)
1. Furnish manufacturer's weathertightness warranty for a maximum of 20 years against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.

C. Roof and Wall Paint Finish Warranty
1. Paint Systems
   a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, and fading.
      1) Color fading exceeding Δ5 Hunter 'NBS' units, as defined by ASTM D2244, which utilizes the National Bureau of Standards (NBS) system for expressing color differences.
      2) Chalking in excess of 8 units as set forth in ASTM D4214.
   b. The warranty shall be for a period of 35 years from the date of shipment for 70% PVDF Cool Coating (polyvinylidene fluoride) paint systems.
   c. The warranty shall be for a period of 25 years from the date of shipment for SP Cool Coating (silicone-modified polyester) paint systems.
2. Galvalume® systems
   a. Furnish manufacturer's standard warranty for the Galvalume® panels against rupture, structural failure, or perforation due to normal atmospheric conditions.
   b. The warranty shall be for a period of 20 years from the date of shipment for Galvalume® systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. American Buildings; http://www.americanbuildings.com
2. CBC Steel Buildings; http://www.cbcsteelbuildings.com
3. Kirby Building Systems; http://www.kirbybuildingsystems.com
4. Nucor Building Systems; http://www.nucorbuildingsystems.com.
5. Butler Buildings; http://www.butlermfg.com.
6. Titan Steel Structures; http://www.titanstructures.com
7. National Steel Buildings; http://www.nationalsteelbuildingscorp.com.
8. Star Building Systems; http://starbuildings.com.

2.2 MATERIALS

A. Primary Framing Steel:
1. Steel for hot rolled shapes must conform to the requirements of ASTM A36, A572 or A992, with minimum yield of 36 or 50 ksi, respectively.
2. Steel for built-up sections must conform to the requirements of ASTM A1011, A1018, A529, A572 or A36 as applicable, with minimum yield of 36, 50, or 55 ksi as indicated by the design requirements.
3. Square and Rectangular Tube must conform to the requirements of ASTM A500 Grade B with a minimum yield strength of 46 ksi.
4. Steel for Cold-Formed sections must conform to the requirements of ASTM A1011 or A1039 Grade 55, or ASTM A653 Grade 55 with minimum yield strength of 55 ksi.
5. X-bracing will conform to ASTM A529 for rod bracing, ASTM A992 for angle bracing or ASTM A475 for cable bracing.

B. Secondary Framing Steel:
1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A1011 or ASTM A1039 Grade 55 for primed material or ASTM A653 Grade 55 for galvanized material with a minimum yield of 55 ksi.
2. Design Thicknesses – Gauge to be determined by design to meet specified loading conditions.

C. Panels:
1. Standing Seam Panels must have:
   a. (For US and Export) 55 percent minimum aluminum-zinc alloy- coating and conform to ASTM A792 or ASTM A653 with a minimum yield of 50 ksi.
2. Panel Finish:
   a. PVDF Finish: 70% PVDF paint system with a 35-year finish warranty.

D. Panel Fasteners:
1. Concealed Fasteners: Self-drilling type, of size required.

E. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.

F. Roof Clips:
1. All clips must have factory-applied mastic and designed so that movement between the panel and the clip does not occur.

2. Short or Tall Fixed clips; shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height. Used for applications where only a moderate amount of thermal expansion and contraction in the roof panel is expected.
3. Short or Tall Sliding clips: shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height and provide either 1-7/8 inches from neutral position or 3 3/4 total inches of travel for panel thermal expansion and contraction, depending on clip choice.
4. Super Tall Sliding clips: shall be 5 ½ inches (140mm) in height and provide either 1-7/8 inches from neutral position or 3 3/4 total inches of travel for panel thermal expansion and contraction.

G. Sealant And Closures:
1. Sidelaps: Factory applied non-skinning Butyl mastic.
2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in pre-cut lengths.
3. Outside Closures: Closed-cell, plastic, or metal.
4. Inside Closures: Closed-cell, plastic, or metal.

2.3 PRIMARY FRAMING

A. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections.
1. Frame Design: Gable Symmetrical.
2. Frame Design: Lean-To.
3. Frame Type: Clear-Span.

B. Rigid Frame Columns:
1. Tapered

C. Rigid Frame Rafters:
1. Straight/Uniform depth
2. Tapered

D. Endwall Frames / Roof Beams: Fabricated as mill-rolled sections or built-up "I" sections depending on design requirements. Fabricate endwall columns of cold-formed sections, mill-rolled sections, or built-up "I" sections depending on design requirements.

E. Exposed canopy columns: HSS sections and prepared for field finishing.

F. Interior Columns: Columns supporting rafters of mainframes shall be of the following cross-section type(s):
1. Tube (Square HSS).
2. "I"-Shaped (Built-Up or Mill-Rolled depending on design requirements).

G. Finish: Red-Oxide or Gray Primer, or galvanized (pre coated galvanized cold-form, hot-dipped otherwise).

H. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM F3125 Grades A325 or A490 as required by design.

2.4 SECONDARY FRAMING

A. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI S100.

They shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the purlin/girt webs, not purlin/girt flanges.

B. Purlins (Excluding Open Web Joists): Horizontal structural members which support roof coverings.
   1. Depth: To be determined by design (8”, 9.5” or 12”)
   2. Maximum Length: To be determined by design.
   3. Finish: Red Oxide Primer.
   4. Finish: Gray Primer.
   5. Finish: Pre-Coated Galvanized.

C. Girts: Horizontal structural members that support vertical panels.
   1. Depth: To be determined by design (8”, 9.5” or 12”)
   2. Maximum Length: To be determined by design.
   3. Finish: Red Oxide Primer.
   4. Finish: Gray Primer.
   5. Finish: Pre-Coated Galvanized.

D. Eave Struts: Equal flange, cold-formed "C" sections or “Z” purlins.
   1. Depth: To be determined by design (8”, 9.5” or 12”)
   2. Maximum Length: To be determined by design.
   3. Finish: Red Oxide Primer.
   4. Finish: Gray Primer.
   5. Finish: Pre-Coated Galvanized.

E. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.
   1. Formed base sill
   2. Base channel
      a. With flashing
   3. Base angle
      a. With flashing
   4. Base girt
      a. With flashing
   5. Finish: Red Oxide Primer

2.5 ROOF PANELS

A. Assembly Performance Requirements: Provide roof products and assemblies meeting the following requirements:
   1. UL 580, Class 90 assemblies approved and listed under manufacturer.
   2. Class A rated and listed in accordance with UL-790 for External Fire.
   3. Class 4 rated and listed in accordance with UL-2218A for Impact Resistance.

B. FM Approvals Rating: Provide FM 4471 Approved assemblies on the basis of the following ratings. All NBG single skin panels meet FM 4471 standards listed below. Identify materials with FM Approvals markings:
      a. External Fire: Class A.
      b. Internal Fire: Class 1.
      c. Hail: Severe.

B. Loc Seam 90 / 360 Roof Panel: A mechanically seamed pan-type standing seam roof panel with concealed clips. Installed directly over purlins. Tested in accordance with ASTM E 1646 and E 1680 for water penetration and air infiltration, and per ASTM E1592 for wind uplift capacity.
   1. Gauge: 22
   2. Dimensions: 16 inches (406mm) wide by 2 inches (51mm) high
   3. Clips: Tall Sliding
   4. Finish/Color: As specified in Article 2.8 PANEL FINISH

2.6 EXTERIOR WALL PANELS

A. As specified in section 074213 – Metal Wall Panels

2.7 ACCESSORIES

A. Canopies: Overhanging or projecting roof structures off the sidewall or endwall with the extreme end usually unsupported. For aesthetic application or to cover entrance or walkway.

B. Roof Line Trim:
   1. Basic Sculptured Trim Type: Low-Eave Gutter (on slope or horizontal) / Sculptured Rake Trim

C. Purlin Extensions: Overhanging or projecting roof structure at the end of a building.

D. Framed Openings: Used to frame out: doors, windows, louvers, and any other openings. Refers to the framing members and flashing which surround an opening and includes jambs, header and or sill, trim, and fasteners.

E. Premium Windows: Self-flashing, self-framing horizontal slide, project in or fixed narrow-lite windows.
   1. Type / Size: As noted on the Contract Drawings.
   2. Type: Fixed Glass
      a. Size: 2 foot by 6 foot (610x1828mm)

G. Liner Panels:
   1. R-Panel Liner Panel: A through-fastened sidewall panel with 1 1/4 inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
      a. Gauge: 24
      b. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high
      c. Finish: As specified in Article 2.8 PANEL FINISHES

H. Soffit Panels:
   1. Flat SL Panel: Flush, lock-joint profile with raised flat pan with concealed fasteners.
      a. Gauge: 24 (std.) with pencil rib.
      b. Dimensions: 12 inches (305mm) wide by 1 1/2 inch (38mm) high
      c. Finish: As specified in Article 2.8 PANEL FINISHES

M. Facades: Decorative structural and panel system projecting from the face of a wall panel.

N. Roof Curbs: Welded units fabricated for Metal Roof application. Minimum 18 gauge Galvalume™ coated steel, with welds cleaned and treated with protective coating compatible with the Galvalume™ substrate. Minimum curb height shall be 8”.
   1. Top of curb to be level with ground, with 1 ½” top flange.
   2. Curb walls insulated with 1 ½”-3lb.density fiberglass insulation.
   3. Welded integral cricket on upslope side of curb to divert water.

4. Metal or plastic rib covers supplied loose for flexibility when installing curb.
5. Standard sub-frame shall be minimum 16 gauge steel.
6. All fasteners and sealants required for installation shall be furnished by Roof Curb manufacturer.

O. Roof Vents: Accessories used on the roof to allow air to pass through.
1. Gravity Ridge Vents: Can be used as single unit or continuous.
a. Size: 9 inch by 10 foot (229x3048mm) with Damper & Lockerpull.
b. Size: 12 inch by 10 foot (305x3048mm) with Damper & Lockerpull.

S. Pipe Flashings: Pipe flashing shall be of a one-piece construction and fabricated from an EPDM membrane and shall have an aluminum base that can be field conformed to any panel configuration. Pipe flashings shall be flexible for mounting on any roof slope. Service temperature ranges shall be from -30°F to +250°F. Three standard flashing sizes shall accommodate pipe sizes from 1/4” diameter up to 13” diameter.
1. Size: ¼” to 4” (6 to 102mm) Pipe
2. Size: 4” to 7” (102 to 178mm) Pipe
3. Size: 7” to 13” (178 to 330mm) Pipe

2.8 PANEL FINISHES

A. Roof Panel:
2. PVDF Panel Paint System (PVDF Resin, 35-year Finish Warranty):
a. Color: Midnight Black (BL) – Color to be determined. Selected from manufacturer’s standard color selections.

C. Liner Panel (R-Panel, A-Panel, Reverse R-Panel):
1. Standard Panel Paint System (Silicone-Modified Polyester Resin, 25-year Finish Warranty):
a. 26 & 24 gauge:
1) Color: LP-1: Polar White (PW)

D. Soffit Panel (Flat SL Panel):
1. PVDF Panel Paint System (PVDF Resin, 35-year Finish Warranty):
a. Color: Midnight Black (BL) – Color to be determined. Selected from manufacturer’s standard color selections.

2.9 FABRICATION

A. General:
1. Shop-fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
2. Shop connections must conform to the manufacturer's standard design practices as defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.
3. All framing members must carry an identifying mark.

B. Primary Framing:
1. Plates, Stiffeners and Related Members: Factory weld base plates splice plates, cap plates, and stiffeners into place on the structural members.
2. Bolt Holes and Related Machining: Shop fabricated base plates, splices, and flanges to include bolt connection holes. Shop fabricated webs to include bracing holes.

3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
4. The manufacturer is responsible for all shop welding inspections in accordance with the manufacturer's IAS Accreditation or CAN/CSA A660 Certification. Special inspection by the buyer or owner may be done in the manufacturer's facility and must be noted on the Contract Documents.
5. Non-Destructive Testing (NDT) - NDT shall be performed and documented as required by the governing building code for this project.

C. Open-Web Roof Joists:
1. Secondary framing for ‘long-bay’ building layouts shall consist of open-web bar joists designed under Steel Joist Institute (SJI) specifications by an SJI-Certified Joist Manufacturer for the prescribed loads.

D. Zee Purlins:
1. Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.

E. Girts:
1. Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.

F. Bracing:
1. Diagonal Bracing:
   a. Longitudinal bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
   b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded at each end or galvanized cable with suitable threaded end anchors. If load requirements dictate, bracing may be of structural angle and/or tube, bolted in place.

2. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column may be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.

3. Flange Braces: The inside compression flange of all primary framing must be braced laterally with angles connecting to the bottom chords of joists or to the webs of purlins/girts so that the flange compressive stress is within allowable limits for any combination of loading.

4. Bridging: Laterally bridge the top and bottom chords of the open-web bar joists as required by design thereof and specified on the building erection drawings.

G. Trapezoidal Standing Seam Panels - General:

1. One side of the panel is configured as female, having factory applied mastic inside the female seam. The female side will hook over the male side and when seamed creates a continuous lock, forming a weathertight seam.

2. Panels are factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.

3. Maximum panel length is 50 feet (16,764mm) unless otherwise noted in the Contract Documents.

4. Endlaps:
   a. Endlaps must have a 16 gauge backup plate and have the (8) endlap joint fasteners installed in dimpled locations in the flat with (1) endlap joint fastener installed in each trapezoid shoulder for a total of (10) fasteners at each endlap.
   b. Apply mastic between the panels and secured with #1/4-14 x 1 1/4 inch (32mm) self-drilling fasteners through the panels and backup plate to form a compression joint.
   c. "Through-the-Roof" fasteners may only be used at endlaps and eaves.

H. Vertical Rib Standing Seam Panels - General:
1. One side of the panel is configured as female, having factory applied mastic inside the female seam. The female side will hook over the male side and when seamed creates a continuous lock, forming a weathertight seam.

2. Panels are factory swaged when endlaps are required. Panels cannot start at both ends of the building and work towards each other.

3. Maximum panel length is 50 feet (16,764mm) unless otherwise noted in the Contract Documents.

4. Endlaps:
   a. Endlaps must have a 16 gauge backup plate and have the (5) endlap joint fasteners installed in dimpled locations in the flat at each endlap.
   b. Apply mastic between the panels and secured with #1/4-14 x 1 1/4 inch (32mm) self-drilling fasteners through the panels and backup plate to form a compression joint.
   c. "Through-the-Roof" fasteners may only be used at endlaps and eaves.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment’s to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer’s tolerances.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.3 INSTALLATION

A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and /or other documents furnished by manufacturer, using proper tools, equipment and safety practices.

B. Erect framing in accordance with *MBMA Metal Building Systems Manual, Chapter IV Common Industry Practices.*

C. Erect bar joists for mezzanine level and plumb. Provide bridging as required.

D. There shall be no field modifications to primary structural members except as authorized and specified by the manufacturer.

3.4 PROTECTION

E. Protect installed products until completion of project.

F. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 21 0001 – BASIC FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits and Regulations
9. Project Management and Coordination
10. Workmanship
11. Protection
12. Painting
13. Cleaning
14. Equipment Selection
15. Shop Drawings
16. Final Inspection and Punch List
17. Operation and Maintenance Manuals
18. Record Drawings
19. Warranties
20. Project Closeout
21. Operation and Adjustment of Equipment
22. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Fire Suppression work.

C. A complete and functional Fire Suppression system installation shall be provided under this Division. Should overlap of work among trades become evident, this shall be called to the attention of the architect. In such event, none of the trades or their suppliers shall assume that he relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Fire Suppression, Plumbing, HVAC and Electrical drawings and specifications assign work (labor and/or materials) to be provided by the General, Fire Suppression, Plumbing, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the General Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

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.

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.

1.4 SCOPE OF WORK

A. The scope of the Fire Suppression work includes furnishing, installing, testing and warranty of all Fire Suppression work shown on the Fire Suppression drawings and specified herein, including Division 00, division 01, Division 21 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “proved,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to ensure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having pipe and fittings fabricated and

delivered in advance of making actual measurements shall be sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.

E. Equipment, or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.

G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ADTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Refer to Sections 017300 Execution.

B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. The fire suppression contractor shall be responsible to prepare a permit set of documents to file for and obtain all required permits from the governing inspection agencies. Include payment of all permit and inspection fees applicable to the work in this Division.

C. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

D. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 WORKMANSHIP

A. Refer to Section 014000 Quality Requirements.

B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

C. Fire suppression design and work shall be performed by licensed Fire Suppression Contractors in accordance with requirements of the jurisdiction.

1.12 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner’s property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges

are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.13 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 21:

1. Ferrous metal which is no factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.

3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.

C. Finish painting is included in the General Contract except where otherwise required under remodeling work.

1.14 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on these surfaces.

1.15 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, the shall be of the same manufacturer. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturer's listed.

2. Where the words "or approved equal: appear after a manufacturer's name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval.

B. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

C. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.

D. If extensive changes in pipe, duct or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.16 SHOP DRAWINGS

A. Refer to Section 01600 Product Requirements.

B. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

C. The review of shop drawings by the Architect or Engineer shall not relieve the Contactor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.

D. Shop drawings for the following Fire Suppression equipment and materials shall be submitted:

1. Pipe, fittings and joining methods for the various systems.
2. Firestopping systems for pipe penetrations.
3. Pipe hangers.
4. Valves.
5. Gauges.
6. Sprinkler heads and accessories.
7. Wet pipe and dry pipe components.
8. Fire department valves.
9. Fire extinguishers and cabinets.
10. Sprinkler system installation drawings per NFPA 13, applicable calculations and water supply flow curve.

1.17 FINAL INSPECION AND PUNCH LIST

A. Refer to Section 017700 Closeout Procedures.

B. As the time of work completion approaches, the Contractor shall survey and inspect his work and develop his own punch list to confirm that it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.

C. Requests to the Architect, Engineer or Owner for final inspection may be accompanied by a limited list of known deficiencies in completion, with appropriate explanation and schedule for completing these; this is in the interest of expediting acceptance for beneficial occupancy.

D. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completing or verification. Corrective action shall be taken by the Contractor to the satisfaction of Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.18 OPERATING AND MAINTENANCE MANUALS

A. Refer to Section 017823 Operation and Maintenance Data.

B. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.

C. These shall be assembled into three-ring loose lead binders or other appropriate binding and also combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.19 RECORD DRAWINGS

A. Refer to Section 017839 Project Record Drawings.

B. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.20 WARRANTIES

A. Refer to Section 017700 Closeout Procedures.

B. This Contractor shall warrant all workmanship, equipment and material entering into this contact for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

C. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer’s recommendations.

D. This provision shall not be construed to include maintenance items such as replacing filters, re-tightening or repacking glands, greasing, oiling belt tightening and cleaning strainers after these have been done for final close-out.

E. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

1.21 PROJECT CLOSEOUT

A. Refer to Section 017700 Closeout Procedures.

1.22 OPERATIONS AND ADJUSTMENT OF EQUIPMENT

A. As the fire suppression systems are placed in operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing air and water systems, adjusting fan speeds, belts, pulleys, tightening packing glands, and adjusting all operating equipment.

B. Test relief valves, air vents and regulating valves to insure proper operation.

1.23 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. Refer to Section 017900 Demonstration and Training as well as individual Division 21 Sections for requirements.

B. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.

C. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.

D. A minimum of 2 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:

1. Show locations of items of equipment and their purpose.
2. Review binder containing instructions and equipment and systems data.
3. Coordinate written and verbal instructions so that personnel understand each.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 21 0001

SECTION 21 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

A. Excavate for all in-grade, under-floor piping, underground, exterior piping and incidental work which are included in the Fire Suppression contract. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 22 0002.

B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.

C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.

D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.

E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bedding Course: Naturally or artificially graded natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

A. Trenches for interior and exterior piping shall be over-excavated and the pipe shall be laid on 6” minimum depth sand bed.

B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or compacted, crushed limestone, 3/4” maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18” above the top of the piping. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.

C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.

D. Backfill shall be mechanically compacted in layers not over 6” deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.

E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. Refer to Division 32 for Surface Restoration requirements. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.

F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.

G. All exterior underground piping shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6’ wide with black letters identifying the piping service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18’ above and on the centerline of the pipe.

END OF SECTION 21 0005

SECTION 21 0519 - METERS AND GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gauges.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PRESSURE GAUGES

A. Pressure gauges, including compound gauges and vacuum gauges, shall be Bourdon tupe type with 4-1/2” dial and cast aluminum case, equal to Trerice 600C Series. Accuracy shall be 1% at mid-range.

B. Pressure gauges for low pressure application, calibrated in inches of water gauge, ounces peer sq. in. or 0-5 psi, as appropriate, shall be equal to Trerice 860.

C. Pressure gauges at pumps shall be liquid filled Bourdon tube type with 4” dial and stainless steel case and internals, equal to Trerice 700 Series.

D. A brass cock or bronze ball valve and a pressure snubber shall be furnished with each pressure gauge.

E. Ranges of pressure gauges shall be selected to be consistent with anticipated pressures. Range shall be approximately twice the normal system working pressure at the gauge location.

2.2 TEST PLUGS

A. Pressure-temperature test plugs for insertion of pressure gauge or thermometer shall be a brass fitting with neoprene or Nordel self-sealing insert and knurled brass cap with plastic capture tab. Fittings shall be equal to Peterson “PT”. Furnish two thermometers and two pressure gauges with integral insertion stem appropriate for use with the test plugs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Thermometers shall be installed where shown on the drawings and also at:

B. Pressure gauges shall be installed where shown on the drawings, where required by applicable codes and also at:

C. Thermometers and gauges shall be positioned to be read with unobstructed view from the floor. Pressure-temperature test plugs shall be installed where shown, located in a position to be most readable.

D. Install thermometer wells in piping tees in the vertical position. Fill the well with oil or graphite and secure the thermometer in position

END OF SECTION 21 0519

SECTION 21 0529 – PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Hanger Rods and Attachments.
3. Pipe Riser Supports
4. Base Mounted Pipe Supports

B. See Specification Section 21 0516 "Expansion Fittings and Loops " for pipe guides and anchors.

C. See Specification Section 21 Seismic Control for Fire Suppression Systems for seismic isolation devices.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:

1. Pear shaped band hanger with adjustable swivel ring type per NFPA standards, lock nut and rod attachment, carbon steel with galvanized finish, Anvil fig. 69.

2.2 HANGER RODS AND ATTACHMENTS

A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below. A hanger attachment device (for attachment to the structure) and locking nut at the hanger attachment shall be provided on each hanger.

Pipe Size	Min. Rod Dia.
4” and smaller	3/8"

B. Hanger rod attachment devices for attachment to the structure shall be:

1. Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.

2. Channel support system equal to Unistrut or Hilti.

2.3 PIPE RISER SUPPORTS

A. Riser clamps shall be:

1. Carbon steel, epoxy coated or galvanized finish- Anvil Fig. 261.

2.4 BASE MOUNTED PIPE SUPPORTS

A. Base mounted pipe supports shall be factory or shop prime coat painted equal to Anvil Fig. numbers as follows:

1. Adjustable pipe saddle support and yoke– Fig. 265.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing of hangers shall be as follows:

1. Steel pipe - Vertical:
   a. At the base and 15 ft. maximum spacing unless otherwise shown.

2. Steel pipe - Horizontal:
   a. 2” size and smaller – 8 ft. intervals
   b. 2-1/2” thru 6” – 10 ft. intervals

B. In piping systems with rolled or cut groove end pipe and mechanical joint couplings, pipe hangers shall be provided on horizontal piping at normal specified intervals and, in addition, so that no pipe shall be left unsupported between any two couplings nor left unsupported whenever a change in direction takes place. Added supports may be omitted on “rigid” couplings such as Victaulic Style 07 Zero-Flex. Vertical piping shall be supported at normal specified intervals or every other pipe length, which ever is more frequent. The base of the riser or base fitting shall be supported.

C. Attachment of pipe hangers to the structure shall be with:

1. Pre-set concrete inserts in concrete construction of 4” minimum depth.

2. After-set concrete inserts, in 4” minimum depth concrete, set in drilled holes. Powder actuated driven fasteners are not permitted.

3. Provide anchoring where steel beam clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.

4. Side beam bracket in wood construction, secured to the wood joist with lag screws set in drilled pilot holes.

5. Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical.

D. Attachment to manufactured trusses and other engineered structural members and supports shall be done in strict accordance with the structural manufacturer’s recommendations. Refer to the architectural and structural drawings for type of engineered structural systems being used. Connections to these structural members shall be made with connection devices and methods approved by the structural manufacturer. Provide additional supports with supplemental steel shapes when spacing between structural members exceeds specified distances.

E. Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position.

F. Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within finished spaces. Ensure that adequate support is still maintained.

END OF SECTION 21 0529

SECTION 21 0530- EQUIPMENT BASES AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Equipment Supports

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Equipment hangers and supports.
2. Equipment bases.
3. Support Curbs.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL SUPPORTS

A. Structural steel angles, beams or channels, unistrut type channels or pipe. Supports shall be fabricated into a rigid framework with welded or bolted connections and cross-bracing or sway bracing. Supports shall be set on slab with base plates, or attached to the building structure as required. Brackets for relatively lightweight equipment may be attached to the wall. Equipment shall be set on and attached to the framework.

B. Solid steel hanger rods supported from the structure above similar to pipe hangers. Provide sway bracing for equipment supported in this manner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Fire Suppression Contractor shall set anchor bolts as required for the equipment.

END OF SECTION 21 0530

SECTION 21 0553 - IDENTIFICATION FOR FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.
2. Warning markers.
3. Valve Tags

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. Pipe markings shall be applied to all piping.

B. Labeling shall be:

1. Plastic semi-rigid snap-on type, manufacturer’s standard pre-printed color coded pipe markers extending fully around the pipe and insulation or pressure-sensitive vinyl pipe markers similar to above.

2.2 WARNING MARKERS

A. Underground line marker tape shall be permanent bright-colored, plastic with continuous identification lettering. Tape over service lines that cannot be detected by a metal detector shall be multi-ply with an aluminum foil core.

2.3 VALVE TAGS

A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2” x 11” paper, tabulating valve number, piping

system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).

B. Valve tags shall be engraved plastic laminate with solid brass S hook. Tags shall be engraved with “F” for Fire Suppression and the designated number.

2.4 ACCEPTABLE MANUFACTURERS

A. Labels, markings and tags shall be manufactured by W.H. Brady, Seton, Allen or Industrial Safety Supply.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification marking and tagging shall be applied after painting has been completed.

B. Coordinate names, abbreviations and other designations used with corresponding designations shown, specified or scheduled on drawings. Verify with Owners’ desired identification marking system.

C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.

D. Pipe markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.

E. Refer to appropriate sections of this specification for installation of underground line marker tape.

F. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 21 0553

SECTION 211100 - FACILITY WATER-SERVICE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire-suppression water-service piping and related components service entrance piping from 5 feet outside the building through floor into the building.

1.2 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. System shall conform to the requirements of NFPA 13 and OBC chapter 9 and other requirements of the authority having jurisdiction.

C. System design shall be approved by authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Approved Sprinkler Piping Drawings and Calculations: Working plans showing service back to public main and hydraulic calculations, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water.
2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve supervision for fire-suppression water-service piping.

1.5 COORDINATION

A. Coordinate connection to water main with site utility contractor.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

2.2 Refer to piping schedule on the Drawings for piping material and applications.

2.3 SLEEVES

A. Cast-Iron Wall-Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard-weight, zinc-coated, plain ends.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Comply with NFPA 24 for fire-service-main piping materials and installation.

B. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

C. Bury piping with depth of cover over top at least with top at least 12 inches below level of maximum frost penetration.

D. Extend fire-suppression water-service piping and connect to piping installed by site utility contractor and building fire-suppression water-service piping systems at locations and pipe sizes indicated.

1. Terminate fire-suppression water-service piping at building floor slab until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.

E. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

F. Comply with requirements in Division 21 Sections for fire-suppression-water piping inside the building.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having 2-1/2” and larger end connections.

C. Ream ends of tubes and remove burs.

D. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

E. All fittings shall be mechanical joints conforming to AWWA C153.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

G. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.4 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and in fire-suppression water-service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 CONNECTIONS

A. Connect fire-suppression water-service piping installed by site utility contractor.

B. Connect fire-suppression water-service piping to interior fire-suppression piping.

3.6 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in exterior walls.

1. Exception: Sleeves are not required for core-drilled holes.

B. Cut sleeves to length for mounting flush with both surfaces.

C. Install sleeves in new walls as they are constructed.

D. Seal space outside of sleeves in concrete walls with grout.

E. Install the following sleeve materials:

1. Galvanized- steel pipe or steel-sheet sleeves for pipes smaller than 6”.

3.7 FIELD QUALITY CONTROL

A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare test and inspection reports.

3.8 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.9 CLEANING

A. Clean and disinfect fire-suppression water-service piping as follows:

1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    c. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 21 1100

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible devices. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Design sprinkler system(s), by a State certified designer, using performance requirements and design criteria indicated.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

C. System shall conform to the requirements of NFPA 13 and OBC chapter 9 and other requirements of the authority having jurisdiction.

D. Sprinkler system design shall be approved by authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Approved Sprinkler Piping Drawings and Calculations: Working plans and hydraulic calculations, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Welding certificates.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

F. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Design Responsibility: Preparation of working plans, calculations, and field test reports by a certified sprinkler designer.

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.

C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to piping schedule on the Drawings for piping material and applications.

2.2 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be listed as UL or FM approved.
2. Minimum Pressure Rating: 175 psig.
3. Acceptable Manufacturers: Subject to compliance with requirements:
    a. Anvil International, Inc.
    b. Kennedy Valve; a division of McWane, Inc.
    c. Stockholm Valve and Fittings.
    d. Tyco Fire & Building Products LP.
    e. Victaulic Company.
    f. Watts Water Technologies, Inc.

B. Check Valves 2 1/2” and larger:

1. Standard: UL 312.
2. Type: Swing check.
3. Body Material: Cast iron.
4. Disc Material: Bronze
5. End Connections: Flanged or grooved.

C. Check Valves 2” and smaller:

1. Standard: UL 312.
2. Type: Swing check.
3. Body Material: Bronze.
4. Disc Material: Composition faced
5. End Connections: Threaded.

D. OS&Y Gate Valves 2” and smaller:

1. Standard: UL 262.
2. Body Material: Bronze.
3. End Connections: Threaded.

E. OS&Y Gate Valves:2 1/2” and larger

1. Standard: UL 262.
2. Body Material: Cast or ductile iron.
3. End Connections: Flanged or grooved.

F. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Valves 2” and Smaller:

    a. Valve Type: Ball or butterfly.
    b. Body Material: Bronze.
    c. End Connections: Threaded.

4. Valves 2-1/2” and Larger:

    a. Valve Type: Butterfly.
    b. Body Material: Cast or ductile iron.
    c. End Connections: Flanged, grooved, or wafer.

5. Valve Operation: Integral electrical, 115-V AC, pre-wired, single-circuit, supervisory switch indicating device.

G. Trim and Drain Ball Valves:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Body Material: Bronze.
3. End Connections: Threaded.

2.3 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.
6. Acceptable manufacturers:
   a. Globe Fire Sprinkler Corporation.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.

B. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175 psig minimum.
3. Type: Automatic draining, ball check.
4. Size: 3/4".
5. End Connections: Threaded.

2.4 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Standard: UL 405.
2. Type: Flush, for wall mounting.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Corrosion-resistant metal.
5. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
6. Caps: Brass, lugged type, with gasket and chain.
7. Escutcheon Plate: Rectangular, brass, wall type.
8. Outlet: With pipe threads.
9. Body Style: Horizontal.
10. Number of Inlets: Two.
11. Outlet Location: Bottom.
12. Escutcheon Plate Marking: Similar to " AUTO SPKR."
13. Finish: Polished chrome plated.

14. Outlet Size: 4”.
15. Acceptable Manufacturers:
    a. Elkhart Brass Mfg. Company, Inc.
    b. Guardian Fire Equipment, Inc.
    c. Potter Roemer.

2.5 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

1. Standard: UL’s "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig**.**
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.
6. Acceptable Manufacturers
    a. Reliable Automatic Sprinkler Co., Inc.
    b. Tyco Fire & Building Products LP.
    c. Victaulic Company.

B. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.
8. Acceptable Manufacturers:
    a. Elkhart Brass Mfg. Company, Inc.
    b. Fire-End & Croker Corporation.
    c. Potter Roemer.

C. Sprinkler Inspector's Test Fittings:

1. Standard: UL’s "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.
6. Acceptable Manufacturers:
    a. Tyco Fire & Building Products LP.
    b. Victaulic Company.
    c. Viking Corporation.

2.6 SPRINKLERS

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
3. Acceptable Manufacturers:
   a. Globe Fire Sprinkler Corporation.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.

B. Automatic Sprinklers:

1. Non-Residential Applications: UL 199.
2. Characteristics: Quick-response type with nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

C. Sprinkler Finishes:

1. Rough brass.
2. Chrome plated.
3. Painted.

D. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications.

1. Concealed Recessed Sprinklers: White -plated steel, two piece, with 1-inch vertical adjustment and a flat cover plate.
2. Sidewall Mounting: Chrome-plated steel one piece, flat.

E. Sprinkler Guards:

1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

F. Dry Sprinklers – In spaces subject to freezing use dry pendent sprinklers.

G. Spare Sprinklers – Furnish spare sprinklers and sprinkler wrench in accordance with the requirements of NFPA 25. Spare sprinklers shall include each type and temperature rating in a proportional amount equal of those installed. Provide a wall mounted cabinet for sprinklers and wrench.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.
7. Manufacturers:
    a. ADT Security Services, Inc.
    b. McDonnell & Miller; ITT Industries.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.
    e. Viking Corporation.
    f. Victaulic Company.

C. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. Manufacturers:
    a. Fire-Lite Alarms, Inc.; a Honeywell company.
    b. Kennedy Valve; a division of McWane, Inc.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.

2.8 PIPE ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with setscrews.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.9 SLEEVES

A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section "Facility Water-Service."

B. Install shutoff valve, check valve, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Locate sprinkler piping in areas protected from freezing.

C. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes 2” and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having 2-1/2” and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

J. Install alarm devices in piping systems.

K. Install hangers and piping supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than 1/4” and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.

M. Install escutcheons for penetrations of walls, ceilings, and floors.

N. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

D. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

E. 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.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

F. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

G. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

H. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.5 SPRINKLER INSTALLATION

A. Refer to the drawing for the locations of various types of sprinklers.

B. Install sprinklers in suspended ceilings in center of acoustical ceiling panels or at the quarter points along the long axis for rectangular panels.

C. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

D. Install sprinkler guards on sprinklers in gymnasiums.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections. Location to be approved by local Fire Department.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, and walls.

B. Sleeves are not required for core-drilled holes in cast walls or floors.

C. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

D. Install sleeves in new partitions, slabs, and walls as they are built.

E. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

F. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

G. Seal space outside of sleeves in concrete slabs and walls with grout.

H. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Coordinate with fire-alarm tests. Operate as required.
5. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Turn spare sprinklers, wrench and cabinet over to owner

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

END OF SECTION 21 1313

SECTION 22 0001 – BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Utilities
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Equipment Selection
16. Shop Drawings
17. Final Inspection and Punch List
18. Operation and Maintenance Manuals
19. Record Drawings
20. Warranties
21. Project Closeout
22. Operation and Adjustment of Equipment
23. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Plumbing work.

C. A complete and functional Plumbing system installation shall be provided under this Division. Should overlap of work among trades become evident, this shall be called to the attention of the architect. In such event, none of the trades or their suppliers shall assume that he relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Plumbing drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

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.

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.

1.4 SCOPE OF WORK

A. The scope of the Plumbing work includes furnishing, installing, testing and warranty of all Plumbing work shown on the Plumbing drawings and specified herein, including Division 00, Division 01, Division 22 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “provide,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to ensure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having pipe and fittings fabricated and delivered in advance of making actual measurements shall bet be sufficiently in advance as to

not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.

E. Equipment or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.

G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ADTM, UL, ASPE, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Front End specifications and drawings for alternate bid items.

1.8 SITE VISIT

A. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. Except where the permit application is made by the Architect or the Engineer, the Plumbing contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the plumbing work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities.

C. Include payment of all permit and inspection fees applicable to the work in this Division.

D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 TEMPORARY UTILITIES

A. Each Contractor requiring water for construction purposes shall connect to wall hydrants or other connection points within the existing building.

B. Install new water service and piping from the new service as soon as practicable to facilitate water supply for construction purposes. Provide a water meter, piping and hoses bibbs with vacuum breaker at the site as directed by the General Contractor. Protect meter and piping from physical damage and freezing.

C. Cost of water use for construction is not included in Division 22.

D. Remove construction water meter and piping when no longer required.

1.12 WORKMANSHIP

A. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

B. Plumbing work shall be performed by licensed Plumbing Contractors in accordance with requirements of the jurisdiction.

1.13 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 22:

1. Ferrous metal which is no factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.

3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 9 of the Specifications. All rust must be removed before application of paint.

C. Finish painting is included in the General Contract except where otherwise required under remodeling work. Refer to the Cutting and Patching paragraph in this Section for finishing requirements

1.15 RECORD DRAWINGS

A. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.16 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

1.17 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturer’s listed.

2. Where the words “or approved equal: appear after a manufacturer’s name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words “equal to” appear, followed by a manufacturer’s name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer’s approval.

C. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

D. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.

E. If extensive changes in pipe, or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.18 SHOP DRAWINGS

A. One set of pdf electronic shop drawings and descriptive information shall be assembled by the Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in the General Conditions and Supplementary Conditions. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.

B. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

C. The review of shop drawings by the Architect or Engineer shall not relieve the Contactor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.

D. Shop drawings for the following Plumbing equipment and materials shall be submitted:

1. Pipe, fittings and joining methods for the various systems.
2. Pipe hangers and saddles.
3. Valves.
4. Flexible connectors.
5. Gauges.
6. Pipe insulation
7. Supply system specialties.
8. Backflow preventers
9. Drainage system specialties
10. Plumbing fixtures and trim
11. Water heating equipment

1.19 OPERATING AND MAINTENANCE MANUALS

A.One electronic copy of operating and maintenance manuals shall be assembled for the Plumbing work by the Contractor.

B. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained form each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.

C. Combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.20 RECORD DRAWINGS

A. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Architect.

1.21 WARRANTIES

A. This Contractor shall warrant all workmanship, equipment and material entering into this contact for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

B. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer’s recommendations.

C. This provision shall not be construed to include maintenance items such as replacing filters, and cleaning strainers after these have been done for final close-out.

D. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

1.22 PROJECT CLOSEOUT

A. The following schedule summarizes actions to be taken or submittals to be completed by Contractor prior to issuance of the Contract Completion Certificates. Refer to Division 1 – General Requirements, and applicable paragraphs of this Sections and the applicable trade Divisions for additional requirements. This information should be submitted at least thirty days in advance of request for final inspection. Where possible, the information shall be bound in 8 – ½’ x 11” hard back binders.

1. Material / Suppliers List
2. Record Drawings
3. Certificate of Inspection

4. Tests and Adjustments
5. Operating Instructions and Maintenance Manuals
6. Equipment and Piping Indentification
7. Completed Punchlist
8. Waiver of Liens
9. Affidavit of Wage Compliance
10. Change Orders and Allowance Adjustments

1.23 OPERATIONS AND ADJUSTMENT OF EQUIPMENT

A. As each piping system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing the domestic hot water return system,

B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician’s judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer’s specific instructions.

C. Test relief valves, air vents and regulating valves to ensure proper operation.

1.24 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.

B. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION– NOT APPLICABLE

END OF SECTION 22 0001

SECTION 22 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

A. Excavate for all in-grade, under-floor piping, underground, exterior piping and incidental work which are included in the Plumbing contract. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 22 0002.

B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.

C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.

D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.

E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bedding Course: Naturally or artificially graded natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

A. Trenches for interior and exterior piping shall be over-excavated and the pipe shall be laid on 6” minimum depth sand bed.

B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or compacted, crushed limestone, 3/4” maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18” above the top of the piping. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.

C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.

D. Backfill shall be mechanically compacted in layers not over 6” deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.

E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.

F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.

G. All exterior underground piping shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6’ wide with black letters identifying the piping service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18’ above and on the centerline of the pipe.

END OF SECTION 22 0005

SECTION 22 0513 - ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for electrical work for Plumbing equipment including 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 and other electrical equipment, devices, fuses, wire, conduit and installation methods.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Ratings and characteristics of supply circuit and required control sequence.
2. Ambient and environmental conditions of installation location.

B. Refer to the Plumbing drawings and also the Electrical drawings for requirements related to each trade. Coordinate all aspects of electrical components and wiring to complete the systems.

1.3 QUALITY ASSURANCE

A. Equipment, devices shall be designed, constructed and installed in accordance with applicable standards of NEMA and the National Electric Code. Equipment shall be tested and listed by UL or other approved agency and installed in accordance with all instructions included as part of such listing.

B. Electrical equipment, devices, fuses, wire, conduit and methods shall comply with applicable provisions of Division 26 - Electrical.

PART 2 - PRODUCTS

2.1 The Plumbing Contractor and equipment suppliers shall compare the electrical power requirements of the intended equipment with power feeders to the equipment shown on the Electrical drawings. Verify adequacy and compatibility of voltage, phase, wiring, capacity, number and size of conductors (versus equipment connection points), fusing and other information on the electrical and mechanical drawings to that required for the equipment. If the selected equipment requires revision of the electrical, added cost must be borne by the Plumbing Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION.

A. All power wiring shall be run in conduit. Control wiring shall be run in conduit except where open wiring is permitted in other applicable specification sections.

B. Fuses shall be furnished and installed in fuse clips of equipment and switches provided by the Plumbing Contractors.

END OF SECTION 22 0513

SECTION 22 0519 - METERS AND GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gauges.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 THERMOMETERS

A. Thermometers shall be 9” blue reading organic spirit filled tube column type with cast aluminum case with epoxy finish, acrylic window, aluminum scale with white background and black markings, 1% accuracy, adjustable angle hinge assembly and 3.5” aluminum insertion stem, equal to Trerice BX91403.

B. Thermometers shall be 5” diameter dial face bi—metallic type with adjustable angle hinge, stainless steel insertion stem and recalibration feature, equal to Trerice B85604.

C. Provide a separable socket insertion thermowell shall be furnished with each thermometer. An extension neck, with appropriate increase in thermometer stem length, shall also be furnished where insulation thickness exceeds 2”.

D. Ranges of thermometers shall be selected from standard Fahrenheit scales to be consistent with anticipated temperatures, typically 0 deg.F.- 160 deg.F.

2.2 PRESSURE GAUGES

A. Pressure gauges, including compound gauges and vacuum gauges, shall be Bourdon tube type with 4-1/2” dial and cast aluminum case, equal to Trerice 600C Series. Accuracy shall be 1% at mid-range.

B. Pressure gauges for low pressure application, calibrated in inches of water gauge, ounces per sq. in. or 0-5 psi, as appropriate, shall be equal to Trerice 860.

C. A brass cock or bronze ball valve and a pressure snubber shall be furnished with each pressure gauge.

D. Ranges of pressure gauges shall be selected to be consistent with anticipated pressures. Range shall be approximately twice the normal system working pressure at the gauge location.

2.3 TEST PLUGS

A. Pressure-temperature test plugs for insertion of pressure gauge or thermometer shall be a brass fitting with neoprene or Nordel self-sealing insert and knurled brass cap with plastic capture tab. Fittings shall be equal to Peterson “PT”. Furnish two thermometers and two pressure gauges with integral insertion stem appropriate for use with the test plugs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Thermometers shall be installed where shown on the drawings and also at:

B. Pressure gauges shall be installed where shown on the drawings, where required by applicable codes and also at:

C. Thermometers and gauges shall be positioned to be read with unobstructed view from the floor. Pressure-temperature test plugs shall be installed where shown, located in a position to be most readable.

D. Install thermometer wells in piping tees in the vertical position. Fill the well with oil or graphite and secure the thermometer in position

END OF SECTION 22 0519

SECTION 22 0523 – GENERAL DUTY VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Valves

B. Related Sections:

   1. Division 22 Plumbing piping Sections for specialty valves applicable to those Sections only. Section 22 0553 "Identification for Plumbing Systems" for valve tags and schedules.

   2. Valves for natural gas, compressed air vacuum systems are specified in the system specification. See appropriate Division 22 specification.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

C. Press-Fit and sweat end valves of equal construction and features are acceptable in lieu of those specified with screwed ends. Grooved pipe fittings are not acceptable.

D. Ball valves in piping which is to be insulated shall have extended shaft necks to accommodate the insulation.

E. All valve for Domestic potable water systems (cold, hot hot return, etc.) shall be “lead free” in accordance with the Federal Safe Water Act (S3874) definition and NSF/ANSI-61 approved.

F. Working pressures shall exceed those imposed by the service applied.

PART 2 - PRODUCTS

2.1 Refer to valve schedule on the Drawings for piping material and applications.

2.2 MANUFACTURERS

A. Valves shall be as specified above, or of equal construction manufactured by:

1. Apollo
2. Crane/Stockham
3. Watts
4. Flowserve
5. Bell & Gossett
6. Griswold
7. Flow Design
8. Nibco
9. Milwaukee
10. Conbraco
11. Armstrong
12. Stockham

2.3 Piping Systems with mechanical joints shall be provided with valves with the same fitting type, i.e., valves with pro-press ends shall be provided in piping systems with pro-press joints.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Drain valves shall be the same as for the shut-off service. Provide a ¾" hose thread adapter on the outlet of each drain valve that is not piped to a drainage point. Hose thread adapters on drain valves of potable water piping shall be fitted with a non-removable vacuum breaker.

B. Internals shall be removed and the remaining elements of sweat end valves shall be protected against heat damage during soldering or brazing

C. Valves shall be installed with the stem at or above the centerline of the pipe. Valves shall be located to be accessible for operation, servicing and/or removal.

D. Packing glands shall be tightened before placing the valves in service.

E. Provide flow measuring gauges with cocks, hoses, and connectors for balancing valves. Provide metering tool.

F. Valves which are insulation shall have extended shafts.

END OF SECTION 22 0523

SECTION 22 0529 – PIPE HANGERS, SUPPORTS, AND PENETRATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel Pipe Hangers
2. Trapeze Pipe Hangers
3. Hanger Rods and Attachments
4. Pipe Riser Supports
5. Pipe Sleeves, Openings, Penetrations, Escutcheons, and Curb

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal hanger shield inserts.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:

1. General Service – Clevis type - Fig. 260.

2. Uninsulated Copper Tubing – Copper plated clevis type - Fig. CT-65 (or plastic-coated clevis, or fiberglass construction).

3. Where the length of the hanger rod between the top of the hanger and the attachment is 3" or less, clevis type hangers with rollers, Fig. 181, shall be used to allow for expansion travel

B. Hangers on insulated horizontal piping shall be oversized to surround the pipe insulation. To protect the insulation from damage or inordinate compression due to concentrated weight, the following shall be provided at each hanger:

1. Pipe 2" and smaller – Anvil Fig. 168 18 ga. sheet metal rib-lock shield with belled ends, 12" long.

2. Pipe 2-1/2" and larger – Factory fabricated assembly equal to Pipe Shields, Inc. A1000.

C. The first two hangers on piping connecting to motor driven equipment shall be fitted with a steel spring and neoprene vibration isolation section similar to Mason Industries, No. 30N.

2.2 TRAPEZE PIPE HANGERS

A. Trapeze hangers for numerous pipes run in parallel may be utilized. Horizontal support members shall be Unistrut type section with pipe rollers (to allow for expansion travel) and spring and nut connectors, suspended with hanger rods and attachments similar to individual pipe hanger suspension.

2.3 HANGER RODS AND ATTACHMENTS

A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below or matching manufacturer’s provisions. A hanger attachment device (for attachment to the structure) and locking nuts at the hanger attachment shall be provided on each hanger. Locking nuts shall be provided at each clevis hanger.

Pipe Size	Min. Rod Dia.
1" and smaller	1/4"
1-1/4" to 3"	3/8"
4" to 6"	1/2"

B. Construction Type – Hanger rod attachment devices for attachment to the structure shall be:

1. Steel Construction – Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.

2.4 PIPE RISER SUPPORTS

A. Riser clamps on cold service insulated piping shall be:

1. Insulated Pipe size 1-1/2" and smaller shall be factory (Pipe Shields E1000) or shop fabricated assembly Fig. 261 with high density calcium silicate insulation and galvanized steel jacket.

2. Insulated Pipe size 2" and greater shall be factory fabricated assembly Pipe Shields, Inc. E1000 or approved equal.

3. Un-insulated copper tubing – Anvil Fig CT-121 or CT-121C

4. Un-insulated steel piping – Anvil Fig. 261.

2.5 PIPE SLEEVES, OPENINGS, PENETRATIONS, ESCUTCHEONS AND CURBS

A. Piping Wall and Floor Sleeves – Non-Fire Rated Assemblies:
1. New Piping – New or Existing Walls and Floors
   a. Poured Concrete - Schedule 40 black steel pipe or 18-gauge galvanized steel
   b. Assemblies other than poured concrete – Schedule 40 black steel pipe or 26-gauge galvanized sheet.
2. Existing Piping – New Walls and Floors
   a. Poured Concrete Floors – 18-gauge Galvanized sheet metal
   b. New walls and partitions – 26-gauge Galvanized sheet metal

B. Piping Wall and Floor Sleeves – Rated Assemblies
1. Refer to specification 22 0004 for requirements.

C. Exterior, Concrete Walls Below Grade
1. New Construction Penetrations – Cast iron pipe or Schedule 40 galvanized steel pipe in exterior walls below grade, with intermediate wall stop and anchor collar set in place before concrete pouring. Sleeves shall be a part of the sealing assembly.
2. Existing Construction, Core Drilled Penetrations – When the wall opening is core-drilled, the wall sleeve may be omitted. A mechanically compressed rubber sealing assembly equal to Thunderline Corp. "Link-Seal" shall be placed in the annular space between pipe and sleeve or core drilling.

D. Roof Deck
1. Roof Membrane Sleeve – Provide sleeve J.R. Smith 1720, or equal, riser sleeve with clamping ring and auxiliary pipe sleeve extending 4" above finished floor or 8" above finished roof. Waterproofing membrane for roof construction shall be secured by the flashing clamping ring. These are to be used in areas having special membrane waterproofing at roof decks.

E. Escutcheon Plates
1. Construction – Escutcheon plates shall be split-ring chromium plated pressed steel. Plates shall be sized to cover the surface penetration and sleeve.
2. Locations – Plates shall be installed on exposed piping in finished rooms and areas where pipes penetrate walls, floors, ceilings or overhead structure.

F. GROUT
1. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
a. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
b. Design Mix: 5000-psi, 28-day compressive strength.
c. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hanger Spacing – Spacing of hangers shall be as follows:

1. Steel pipe - Vertical:
a. At the base and 15 ft. maximum spacing unless otherwise shown.

2. Steel pipe - Horizontal:
a. 2” size and smaller – 8 ft. intervals
b. 2-1/2” thru 6” – 10 ft. intervals
c. 8” and larger – 12 ft. intervals.

3. Cast iron pipe - Vertical
a. At the base and 15 ft. maximum spacing unless otherwise shown.

4. Cast iron pipe – Horizontal
a. At 10 ft. intervals.
b. Support each length of pipe not more than 18” from the joint.
c. Support terminal ends of horizontal runs and branches and each change in direction.
d. 5” and larger provide bracing to prevent horizontal movement in accordance with CISPI “Soil Pipe and Fittings Handbook”

5. Copper Tubing - Vertical
a. At the base and 10 ft. maximum spacing unless otherwise shown.

6. Copper Tubing – Horizontal
a. 1-1/4” size and smaller – 6 ft. intervals
b. 1-1/2” thru 2” – 8 ft. intervals
c. 2-1/2” and larger – 10 ft. intervals

7. Plastic pipe
a. Per manufacturer’s recommendations.

B. Installation Details – Refer to hanger installation details on drawings for installation information supplemental to this specification section.

C. Structural Attachments – Attachment of pipe hangers to the following structure types:

1. Steel Decks – Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical.
2. Manufactured Truss Attachment – Attachment to manufactured trusses and other engineered structural members and supports shall be done in strict accordance with the structural manufacturer's recommendations. Refer to the architectural and structural drawings for types of engineered structural systems being used. Connections to these structural members shall be made with connection devices and methods approved by the structural manufacturer. Provide additional support with supplemental steel shapes when pipe spacing between structural members exceeds specified distances.

D. Adjustment
1. Hanger Adjustment – Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position before pipe insulation is installed.
2. Pipe Riser Clamps – Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within the pipe chase. Ensure that adequate support is still maintained.

E. Painting – Hanger assemblies which will remain exposed to public view upon completion of the project shall be painted prior to pipe installation.

3.2 PIPE SLEEVES

A. General – Pipe sleeves, floor and wall openings, water protective curbing and escutcheon plates shall be provided as described below. Pipe sleeves shall be placed in all above grade floor slabs, poured concrete roof decks, walls and partitions, except as noted below, to allow new piping to pass through and allow for expansion, contraction and normal movement of the pipe. Sleeves are also required for all existing piping related to the various trades in new walls, partitions, floors and roof slabs, same as for new piping.

B. Sleeve Coordination – Pipe sleeves shall be placed in the initial stages of construction before concrete, masonry and other general construction activity. Means shall be taken to ensure that the sleeve will not move during or after construction. Beams, columns and other structural members shall not be sleeved except upon approval of the Architect and/or Structural Engineer.

C. Sleeve Exceptions – Pipe sleeves are <u>not</u> required in the following instances:

1. In floor slabs on grade.
2. In stud and gypsum board or plaster walls and partitions which are not fire rated.
3. For uninsulated pipe passing through masonry walls and partitions and stud and gypsum board or plaster walls and partitions not anticipated to be subject to thermal expansion, such as compressed air, medical gas or natural gas piping.
4. In core drilled openings in solid concrete not requiring water protection. Sleeves are required, however, at core drilling through hollow pre-cast slabs and concrete block walls, to facilitate containment of required firestopping material.
5. In large floor openings for multiple pipe and duct risers which are within a fire rated shaft, unless the opening is to be closed off with concrete or other material after pipe are set.

D. Sleeve Sizing – Length of wall sleeves shall be such that the sleeve ends are substantially flush with both sides of the wall or partition. Floor sleeves shall be flush with the bottom and top of the floor slab except, in mechanical rooms and other areas which might have water on the floor, sleeves shall project a minimum of 1" above finished floor. Pipe sleeves shall be sized to allow insulation to pass through the sleeve, for insulation requiring continuous vapor barrier (domestic cold water, chilled water refrigerant, etc.). Where vapor barrier continuity is not needed, the sleeve may be sized to pass the pipe only or the insulation as well. Refer to the following paragraph for qualification and exceptions relating to firestopping.

3.3 MECHANICAL SEALS

A. Aboveground, Exterior-Wall Pipe Penetrations – Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Steel Pipe Sleeve – Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Cast Iron Sleeve – Install cast-iron pipe for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal – 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 them in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

B. 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 them in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 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.

END OF SECTION 22 0529

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Warning markers.
4. Valve tags.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Each item or major equipment shall be labeled. This shall include water heaters, pumps, tanks, air compressors, …. and other similar equipment consistent with tags on drawings.

B. Labeling shall be:

1. Permanently attached engraved brass or plastic laminated signs with 1” high lettering. Signs on exterior equipment shall be brass.

2. Stencil painted identification, 2” high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel.

2.2 PIPE LABELS

A. Pipe markings shall be applied to all piping.

B. Labeling shall be:

1. Snap-On Type – Plastic, semi-rigid snap-on type, manufacturer's standard pre-printed pipe markers or pressure-sensitive vinyl pipe markers.

2. Adhesive Type – Strip-type markers fastened to the bare pipe or insulation with laminated or bonded application or plastic tape not less than 1-1/2" wide. On piping and insulation 6" and greater diameter provide full band.

3. Lettering heights shall be as specified by manufacturer for indicated pipe/pipe plus insulation size.

4. Markers shall extend fully around pipe and insulation or full circle at both ends of the marker.

5. Markers shall be color coded for service.

6. Flow direction arrows provided integral with the pipe marker or separate at each marker.

7. Service pressure for compressed air and natural gas piping systems.

8. In areas where exposure to water or high humidity is anticipated, provide washdown, fade-resistant style labels.

2.3 WARNING MARKERS

A. Underground line marker tape shall be permanent, bright-colored, plastic with continuous identification lettering. Tape over service lines that cannot be detected by a metal detector shall be multi-ply with an aluminum foil core.

2.4 VALVE TAGS

A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2" x 11" paper, tabulating valve number, piping system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).

B. Valve tags shall be polished brass or plastic laminate with solid brass S hook. Tags shall be engraved with "P" for Plumbing and the designated number.

2.5 ACCEPTABLE MANUFACTURERS

A. Labels, markings and tags shall be manufactured by:
1. W.H. Brady
2. Seton
3. Allen
4. Industrial Safety Supply
5. McMaster-Carr

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification marking and tagging shall be applied after insulation and painting has been completed.

B. Coordinate names, abbreviations and other designations used in plumbing identification work, with corresponding designations shown, specified, or scheduled on drawings.

C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.

D. Equipment labeling shall consist of unit designation as shown on the drawings.

E. Pipe markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.

F. Refer to appropriate sections of this specification for installation of underground line marker tape.

G. Service pressure markings to be placed upstream and downstream of regulators at each pipe service label.

H. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 22 0553

SECTION 22 0719 - PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Fiberglass.

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.

2. Thickness and covering table.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting 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 and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

B. Thicknesses shall be in compliance with ASHRAE 90.1.

PART 2 - PRODUCTS

2.1 INSULATION GENERAL

A. Refer to insulation schedule on the Drawings for piping material and applications.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2 FIBERGLASS

A. Factory molded tubular fiberglass with “all service” jacket having an integral vapor barrier. The longitudinal joints of the jacket shall be overlapping with factory applied adhesive. In lieu of the factory adhesive, staples on 6” centers may be used with vapor barrier mastic applied to seal both the joint and staple holes. Butt joints shall be sealed with 3” wide ASJ pressure sensitive tape.

B. Vapor barrier jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.

C. Manufactures:
1. Johns Manville Corporation
2. Owens Corning Corp.
3. Knauf Fiber Glass
4. Manson

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be done by tradesmen specializing in insulation work in strict accordance with the manufacturer’s recommendations.

B. Overlap and seal all longitudinal joints. Staples and adhesive may be used as stated above. Tape and seal cross joints. Vapor barrier shall be continuous on insulation of all cold services. Vapor barrier type mastic shall be used w here needed to maintain a vapor seal.

C. Where insulation is terminated, insulation shall be beveled at 45 degrees and the beveled surface sealed with vapor barrier mastic. PVC caps over straight cut ends which have been vapor sealed may be used in lieu of beveling.

D. Mechanical joint fittings and couplings shall be considered as a part of the pipe line and shall be insulated. Bidders on the insulation work are cautioned to verify during the bidding period the extent of this work.

E. Insulation on cold service piping shall be run through floor and wall sleeves to maintain vapor barrier continuity. Insulation on other services may likewise be run continuous when sleeve size permits. Refer to Section 22 0529 for non-compressible insulation material and sheet metal saddles required at pipe hangers. Coordinate with the contractor on the furnishing, installation

and detailed requirements of these. Provide insulation and vapor barrier on and around supports for pipe risers of services which require vapor seal so as to prevent sweating.

F. Re-insulate piping where existing insulation has been damaged or removed in the performance of work in this project.

G. Verify that piping has been tested before applying insulation materials and that piping surfaces are clean and dry, with foreign material removed.

H. Fittings, valves, flanges and other devices, both exposed and concealed, requiring insulation shall be covered same thickness as pipe insulation with:

1. Factory molded fitting insulation cover with PVC one-piece fitting cover.

2. Miter-cut segments of pipe insulation, held in place with adhesive and/or wire, filled with insulating cement smoothed to shape and covered with PVC one-piece fitting cover.

3. Fiberglass blanket insulation, held in place and covered with PVC one-piece fitting cover.

4. Oversized pipe insulation, where applicable, finished same as straight run pipe insulation.

I. Storm drainage insulation includes interior horizontal above ground piping including underside of roof drain sumps and outlet piping. Secondary (emergency) roof drainage system piping does not require insulation but roof drain sumps and the first 10 feet of piping shall be insulated.

J. Sanitary drainage piping receiving condensate from central air handling unit cooling coil drain pans including- floor drain sump, trap and horizontal above ground piping to the vertical stack or to the downstream horizontal piping main shall be insulated with 1” thickness.

END OF SECTION 22 0719

SECTION 22 1116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and above ground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Unions and Flanges.
3. Dielectric Connectors.

B. Related Sections:
1. 22 0523 General Duty Valves
2. 22 0529 Pipe Hangers, Supports, and Penetrations
3. 22 1119 Domestic Water Piping Specialties

1.2 SUBMITTALS

A. Product Data: For each type of product used.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Welders shall be qualified and fully certified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

F. Welding procedures and testing shall comply with ANSI Standard B31.1.0 Standard Code for Pressure Piping, Power piping and The American Welding Society Welding Handbook.

G. Electrical Characteristics for Plumbing Equipment: Equipment of higher 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. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPING MATERIAL

A. Refer to piping schedules on the Drawings for piping materials and applications.

2.2 UNIONS AND FLANGES

A. Unions
1. Unions on copper tubing, all bronze construction 150 lb., solder ends.
2. Unions on steel pipe 2” and smaller, malleable iron with ground seat, bronze to steel, 300 lbs., screwed ends.

B. Flanges
1. Flanges on steel pipe with welded or screwed joints, 2-1/2” and larger.
2. Gaskets shall be 1/16” thickness full face compressed sheet suitable for temperature and pressure ranges of the application.
3. Mechanical joints associated with grooved end pipe are not acceptable in lieu of unions and flanges.

2.3 DIELECTRIC FITTINGS

A. A dielectric connector shall be incorporated at each connection between ferrous and copper piping. Connectors shall be:

1. Dielectric coupling with non-conductive polymer liner, Lochinvar Corp. “V-line” Dielectric fitting on services 180 degrees and less.
2. Dielectric flange with non-metallic bolt hole grommets and gasket.
3. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, 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 Coordination Drawings.

B. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burrs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

C. Piping shall be installed consistent with good piping practice and installed in concealed locations, unless otherwise indicated, and except in equipment rooms and service areas. Coordinate with other trades to attain a workmanlike installation.

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. Piping shall be pitched for drainage. The low points shall be fitted with a ¾" drain valve (with hose thread adapter if not piped to a floor drain) except that on piping 1-1/4" and smaller where a drain valve is not shown, a drain plug is acceptable. Hose thread adapters on drain valves of potable water piping shall be fitted with non-removable vacuum breaker.

F. Piping shall be supported as specified in Section 22 0529 Pipe Hangers, Supports and Penetrations. Pipe alignment in both the horizontal and vertical must be tightly maintained. Misalignment must be corrected to the satisfaction of the Engineer before insulation is applied and the system accepted.

G. Internals of sweat end valves shall be removed when damage or warping could occur due to applied heat of soldering. Where silver brazing is specified, solder connection of valves shall be used to reduce the danger of damage. Close open ends of piping during installation to keep interior of the pipe clean.

H. Install strainers as indicated on the drawings. Provide a nipple and ball valve in the blow down connection of each strainer 2" and larger.

I. Close open ends of piping during installation to keep interior of pipe clean.

J. Piping shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.

K. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.

L. Provide dielectric fitting between copper and ferrous piping.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

N. Install piping to permit valve servicing.

O. Install piping adjacent to equipment and specialties to permit servicing and maintenance.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install piping to allow application of insulation.

S. Select system components with pressure rating equal to or greater than system operating pressure.

T. Install escutcheons for penetrations of walls, ceilings, and floors.

U. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

V. Annular space around piping through all wall penetrations shall be sealed off with a fire stopping system (rated walls) or permanent pliable caulking (non-rated walls).

3.2 FIELD QUALITY CONTROL

A. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Domestic water piping – hydrostatic at 125 psig for 6 hours at the low point of the system. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

C. Domestic water piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 TESTING

A. Piping shall be air tested at 125 psi for a minimum of 6 hours at the low point in the system before flushing.

3.4 PIPE CLEANING

A. Before placing each water piping system in operation, the piping system shall be thoroughly flushed out with clean water.

3.5 DISINFECTION OF PIPING

A. All new domestic water piping shall be disinfected by a company or personnel regularly engaged in the performance of this service.

B. Disinfection shall be performed in accordance with AWWA C651- 86 Standards. Disinfection shall be means of a chlorine solution injected into the water system near the source. Outlets throughout the system shall be tested to prove presence of minimum chlorine concentration. Flush out the system with clean water until the residual chlorine content is not greater than .2 parts per million or until approved by the Health Department.

C. Disinfection procedures shall be witnessed by the Architect, Engineer or other qualified representative.

END OF SECTION 22 1116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Temperature-actuated water mixing valves.
5. Strainers.
6. Hose bibbs.
7. Wall hydrants.
8. Drain valves.
9. Water hammer arresters.
10. Trap-seal primer valves.

B. See Division 22 Section "Domestic Water Piping" for water meters.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ames Co.
    b. Cash Acme.
    c. Conbraco Industries, Inc.
    d. FEBCO; SPX Valves & Controls.
    e. Watts Industries, Inc.; Water Products Div.
    f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: 1/4” to 3”, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ames Co.
    b. Cash Acme.
    c. Conbraco Industries, Inc.
    d. FEBCO; SPX Valves & Controls.
    e. Watts Industries, Inc.; Water Products Div.
    f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ames Co.
    b. Cash Acme.
    c. Conbraco Industries, Inc.
    d. FEBCO; SPX Valves & Controls.
    e. Watts Industries, Inc.; Water Products Div.
    f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig /(Insert pressure) maximum, through middle 1/3 of flow range.
5. Size: 3/4” to 3”, as required to match connected piping or as noted on drawings.
6. Body: Bronze for 2” and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved/steel with interior lining complying with AWWA C550 or that is FDA approved/stainless steel for 2-1/2” and larger.
7. End Connections: Threaded for 2” and smaller; flanged for 2-1/2” and larger.
8. Configuration: Designed horizontal flow.
9. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet of 2” and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of 2-1/2” and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cash Acme.
    b. Conbraco Industries, Inc.
    c. Watts Industries, Inc.; Water Products Div.
    d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: 1/2” to 3”, as required to match connected piping or as noted on drawings.
5. Body: Bronze with chrome-plated finish for 2” and smaller.
6. End Connections: Threaded for 2” and smaller; flanged for 2-1/2” and 3”.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Point of Use Thermostatic Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bradley Corporation
    b. Lawler Manufacturing Company, Inc.
    c. Leonard Valve Company.
    d. Powers; a Watts Industries Co.
    e. Symmons Industries, Inc.

2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, thermometer on outlet, temperature-control handle.
8. Tempered-Water Setting: 105 deg F **.**
9. Tempered-Water Design Flow Rate: 0.5 gpm minimum**.**
10. Valve Finish: Rough bronze.
11. Piping Finish: Copper.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers.

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for 2” and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for 2-1/2” and larger.
3. End Connections: Threaded for 1/2” and smaller; flanged for 2-1/2” and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

    a. Strainers 2” and Smaller: 0.020 inch /0.033 inch /0.062 inch/(Insert size).
    b. Strainers 2-1/2” to 4”: 0.045 inch/0.062 inch/0.125 inch/(Insert size).
    c. Strainers 5” and Larger: 0.10 inch/0.125 inch/0.25 inch/(Insert size).

6. Drain: Hose-end drain valve.

2.6 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Woodford Manufacturing Company.
    g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed -outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig .
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: 3/4”.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Include operating key with each key operated hose bibb

B. Vacuum Breaker Wall Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Woodford Manufacturing Company.
    g. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASSE 1019, Type A or Type B.
4. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
5. Classification: Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
6. Pressure Rating: 125 psig.
7. Operation: Loose key.

8. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
9. Inlet: 1/2".
10. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves.

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: 3/4".
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. PPP Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    g. Tyler Pipe; Wade Div.
    h. Watts Drainage Products Inc.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.9 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MIFAB, Inc.
b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: 1/2” threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: 1/2” threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.

E. Install water hammer arresters on each quick closing valve in water piping according to PDI-WH 201.

F. Install trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

G. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

H. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Intermediate atmospheric-vent backflow preventers.
2. Reduced-pressure principal backflow preventers.
3. Double-check backflow-prevention assemblies.
4. Water pressure-reducing valves.
5. Primary, thermostatic, water mixing valves.
6. Supply-type, trap-seal primer valves.

I. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure principle backflow preventer assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 1119

SECTION 22 1316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:

B. Pipe, tube, and fittings.

C. Special pipe fittings.

1.2 Related Sections:

A. 22 0529 Pipe Hangers, Supports and Penetrations

B. 22 1319 Sanitary Waste Piping Specialties

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

B. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Product Data: For each type of product used.

1.5 QUALITY ASSURANCE

A. All piping shall conform to the requirements of the current version of the Ohio Building Codes.

B. Comply with ASME B31.9 “Building Services Piping”.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Cast iron pipe, fittings, and standard duty no-hub couplings shall be listed by NSF International and marked with “NSF” demonstrating certification.

E. Plastic piping and components shall comply with NSF 14, "Plastics Piping Systems Components and Related Materials,". Include marking with "NSF-DWV" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to “BUILDING DRAIN SYSTEMS SCHEDULE SANITARY, & VENT” on drawings for pipe materials.

2.2 PLENUMS

A. PVC piping shall not be used in return air plenums.

PART 3 - EXECUTION.

3.1 PIPING INSTALLATIONS

A. Drawing plans, 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 Coordination Drawings.

B. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burrs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

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. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends and long-sweep bends. Sanitary tees and short-sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.

F. Piping shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

H. Install piping adjacent to equipment and specialties to permit servicing and maintenance.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Verify final equipment locations for roughing-in.

O. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

P. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section “Pipe Hangers, Supports and Penetrations”.

Q. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

R. On piping 5” and larger provide bracing at every branch opening or change in direction as required by CISPI’s "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

S. Piping suspended 18” or more shall be provided with sway bracing as required by CISPI’s “Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

T. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back-to-back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

U. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

V. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow for piping smaller than 3” and; 1 percent downward in direction of flow for piping 3” and larger.
2. Vent Piping: slope down toward vertical fixture vent or toward vent stack.

W. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

X. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

Y. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

Z. Annular space around piping through all wall penetrations shall be sealed off with a fire stopping system (rated walls) or permanent pliable caulking (non-rated walls).

AA. Refer to Division 22 Section "Pipe Hangers, Supports, and Penetrations" for hanger, escutcheon, and sleeve requirements.

BB. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

3.2 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.

C. Hubless Joints: Make with rubber gasket and sleeve or clamp.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

1.

3.3 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code or indicated on the drawings.

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3.4 FIELD QUALITY CONTROL

A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction. All pipe openings shall be covered through construction to prevent debris from entering the sanitary system.

B. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

C. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

D. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

E. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

F. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

G. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

H. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

I. Prepare reports for tests and required corrective action.

3.5 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Plugs the ends of uncompleted piping at end of day and when work stops.

3.6 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 1316

SECTION 22 1319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Roof flashing assemblies.
   4. Miscellaneous sanitary drainage piping specialties.
   5. Flashing materials.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

A. Floor drains shall be as indicated on the drawings:

   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Josam Company; Josam Div.
      b. MIFAB, Inc.
      c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      d. Tyler Pipe; Wade Div.
      e. Watts Drainage Products Inc.
      f. Zurn Plumbing Products Group; Specification Drainage Operation.
      g. Wade Manufacturing Company Division of Tyler Pipe

2.2 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

1. Manufacturer shall be same as floor drains.
2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Manufacturer shall be same as floor drains.
2. See drawing schedule for type.

C. Cast-Iron Wall Cleanouts

1. Manufacturer shall be same as floor drains.
2. See drawing schedule for type.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

B. Floor-Drain, Trap-Seal Maintenance Device:

1. Description: Device inserted into the drain body or adjustable strainer that opens to allow water to pass thru and closes to prevent sewer gases from entering the room from the drainage system.
2. Must conform to ASSE 1072.
3. Size: Same as floor drain outlet.

C. Air-Gap Fittings

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.

4. Locate at base of each vertical soil and waste stack.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 2 inches above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

N. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 1319

SECTION 22 1613 – NATURAL GAS HOUSE PIPING

PART 1 - GENERAL

A. SUMMARY
   1. Section Includes:
      a. Piping, Tubes, and Fittings Materials
      b. Piping Specialties
         1) Gas Pressure Regulators
         2) Transition Fittings
         3) Transition Service-Line Risers
      c. Valves
      d. Dielectric Fittings

B. Related Sections
   1. 22 0004 Fire Stopping for Plumbing Systems
   2. 22 0529 Pipe Hangers, Supports, and Penetrations

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings –
   1. Piping and Valves: 100 psig minimum unless otherwise indicated.
   2. Service Regulators – 100 psig minimum unless otherwise indicated.

B. Compliance – All gas piping work shall be in accordance with NFPA 54/the International Fuel Gas Code (IFGC) and the Gas Company requirements. Verify materials selected and installation methods are in conformance before installation.

C. House Pressure – Intermediate natural gas piping shall run between the Gas company meter setting and the building at an intermediate pressure of 5 psi. At the building the pressure shall be regulated down to 7“w.c. which shall enter the building and be distributed to each item needing natural gas.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Welding certificates.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Materials and installation shall conform to standards and requirements of the Gas Company and the Ohio Building Code including the referenced International Fuel Gas Code.

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PIPING MATERIAL

A. Refer to piping schedule on the Drawings for piping material and applications.

2.2 PIPING SPECIALTIES

A. Gas Pressure Regulators:

1. Construction – Gas pressure regulator shall be self-operating spring-loaded type. Valve body shall be cast iron, 125 psi construction with screwed or flanged connections. Spring and diaphragm casings shall be aluminum. Regulator should have an internal relief valve assembly, tapped vent connection with removable screen on the spring casing and an external pilot operator to afford a 5% maximum droop. Over-pressure protection shall be ten times the inlet pressure (or higher as may be required by the gas company).

2. Performance – Refer to the drawings for capacity, inlet and outlet pressures and installation detail.

3. Manufacturers – Sensus or equal by Fisher, Sprague or Equimeter.

B. Transition Fittings:

1. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

2. Anodeless Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. [Vent casing aboveground.]
c. Aboveground Portion: PE transition fitting.
d. Outlets shall be threaded or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

C. Transition Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
b. Outlets shall be threaded or suitable for welded connection.
c. Bridging sleeves over mechanical coupling.
d. Factory-connected anode.
e. Tracer wire connection.

f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.3 VALVES

A. General

1. Exterior valves shall comply with ASME B16.33.
2. Interior valves shall comply with ASME B16.44.
3. Refer to schedule on drawings for valve information.

2.4 DIELECTRIC FITTINGS

A. A dielectric connector shall be incorporated at each connection between ferrous and copper piping. Connectors shall be:

1. Dielectric coupling with non-conductive polymer liner, Lochinvar Corp. “V-line” Dielectric fitting on services 180 degrees and less.
2. Dielectric flange with non-metallic bolt hole grommets and gasket.
3. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General – Drawing plans, 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 Coordination Drawings.

B. Prohibited Locations – Refer to NFPA 54/the International Fuel Gas Code (IFGC) for additional information on prohibited or restricted locations for piping and piping accessories.

C. Workmanship – Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

D. Pipe Routing & Location Requirements –

1. Install piping in concealed locations, unless otherwise indicated, except in equipment rooms and service areas.
2. 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.

3. Electrical Coordination – Piping shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.
4. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
5. Install piping adjacent to equipment and specialties to permit servicing and maintenance.
6. Install piping free of sags and bends.
7. Install fittings for changes in direction and branch connections.

E. System Component Selection – Select system components with pressure rating equal to or greater than system operating pressure.

F. Pipe Penetrations

1. Install escutcheons for penetrations of walls, ceilings, and floors.
2. Install sleeves for pipes passing through concrete and masonry walls and gypsum-board partitions.

G. Equipment Verification – Verify final equipment locations for roughing-in and with other trades.

H. Outdoor & Underground Piping –

1. Frost Depth – Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

2. Underground Containment – If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

3. Underground, Polyethylene (PE) Piping – Install underground, PE, natural-gas piping according to ASTM D 2774.

4. Steel Piping with Protective Coating –

   a. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
   b. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
   c. Replace pipe having damaged PE coating with new pipe.

5. Fittings – Install fittings for changes in direction and branch connections.

6. Exterior-Wall Pipe Penetrations –
   a. Sleeves – Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   b. 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 them in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

7. Pressure Regulators – Gas pressure regulators shall be installed in accordance with the manufacturer's instructions.
   a. Assembly – Provide valved pressure gauge taps upstream and downstream of the regulator and a pressure gauge on either side of the regulator. Provide pilot regulator piping and miscellaneous valves, devices and piping to complete the installation.
   b. Vent Piping – Outdoor regulator vent piping is not required unless the regulator is located within 10 feet of a door, window or other mechanical ventilation opening. Vent piping shall be routed to discharge the specified 10 feet from any such opening.
   c. Pressure gages are specified in Division 22 Section "Meters and Gages".

8. Identification – Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

9. Tracer Wiring – Install a single, highly molecular weight polyethylene (HMWPE) 14 AWG conductor, insulated tracer wire along run of natural gas piping. Wire shall have yellow insulation. Terminate wire above grade at each end of piping in a NEMA-3R weatherproof junction box. ASTM D-1248 for use polyethylene piping and UL 83 for conductor.

10. Painting – Piping installed above ground and outdoors shall be prime coat and painted to protect it from corrosion. Painting shall be gray in color.

I. Indoor Piping Installation

1. Location Restrictions – Valves, unions and threaded joints are not permitted in inaccessible locations. Valves shall not be in ceiling air plenums and/or other air plenums or ducts.

2. Equipment Connections

   a. Provide a shutoff valve and a dirt and moisture leg with screwed end cap on the pipe drop to each item of equipment.
   b. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.

3. Pressure Regulators – Gas pressure regulators shall be installed in accordance with the manufacturer's instructions.

   a. Assembly – Provide valved pressure gauge taps upstream and downstream of the regulator and a pressure gauge on either side of the regulator. Provide pilot regulator piping and miscellaneous valves, devices and piping to complete the installation.
   b. Venting – Vent piping shall be extended individually from each regulator and gas venting device to outside the building in an approved location away from ventilation openings, doors and windows.

4. Hangers, Supports, and Penetrations – Refer to Division 22 Section "Pipe Hangers, Supports, and Penetrations" for hanger, support, escutcheon, and sleeve requirements.

J. Identification – Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

K. Electrical Bonding – The aboveground portion of the gas piping system shall be electrically continuous and bonded to an effective ground-fault current path. Refer to the IFGC for additional information.

L. Purging – Comply with NFPA 54/the International Fuel Gas Code (IFGC) for installation and purging of natural-gas piping.

M. Inspections & Pressure Testing – Refer to Field Quality Control Section below.

3.2 PIPING JOINT CONSTRUCTION

A. Cleaning

1. Ream ends of pipes and tubes and remove burs.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

B. Threaded Joints

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burs and restore to full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

C. Welded Joints

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturers at field welds and where damage to coating occurs during construction.

D. Flared Joints

1. Cut tubing with roll cutting tool.
2. Flare tube end with tool to result in flare dimensions complying with SAE J513.
3. Tighten finger tight, then use wrench. Do not overtighten.

E. PE Piping Heat-Fusion Joints

1. Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

2. Plain-End Pipe and Fittings: Use butt fusion.
3. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.3 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance.

B. Install regulator with maintenance space adequate for servicing and testing.

3.4 CONNECTIONS

A. Connect to utility's gas service according to utility's procedures and requirements.

B. Grounding – Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Equipment Access – Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Equipment Connections – Connect piping to appliances using manual gas shutoff valves and unions. Install valves within 72 inches of each gas-fired appliance and equipment. Install a union between the shutoff valves and appliances or equipment.

E. Dirt Traps – Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.5 FIELD QUALITY CONTROL

A. Testing – Test, inspect, and purge natural gas according to NFPA 54 /the International Fuel Gas Code and authorities having jurisdiction. Test pressure shall be 3 psi or 1.5 times the working pressure whichever is greater.

B. Underground Piping – Testing shall be performed prior to backfilling.

C. Natural gas piping will be considered defective if it does not pass tests and inspections. Install new piping or components as required to pass tests.

D. Reporting – Prepare test and inspection reports.

END OF SECTION 22 1613

SECTION 22 3416 –INSTANEOUS TANKLESS GAS-FIRED WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following fuel-fired water heaters:

1. Commercial, instantaneous tankless, gas water heaters.
2. Water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

D. Warranty.

1.3 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. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: From date of Substantial Completion:

a. Commercial, Gas Water Heaters: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS WATER HEATERS

A. Commercial, Power-Burner, Tankless, Gas Water Heaters: Comply with ANSI Z21.10.3/CSA 4.3.

1. Fully modulating, on-demand, condensing gas fired tankless water heater(s)

2. The heater shall have ¾ in. male NPT water and gas connections.

3. The heater(s) shall incorporate an integrated temperature controller that will provide diagnostic information, fault history, and heater set temperature.

4. The heater(s) shall operate using 120 V / 60 Hz power source. The heater(s) will incorporate a factory installed power cord.

5. The indoor heater(s) shall be vented with 3” or 4” diameter schedule 40 PVC, CPVC, ABS, or Category IV vent pipe with a length not to exceed 70 ft. (equivalent) for 3” vent or 100 ft. (equivalent) for 4” vent, terminating horizontally or vertically. The intake pipe may use material such as PVC, ABS, aluminum, or Category IV pipe and cannot exceed 70 ft. (equivalent) for 3” vent or 100 ft. (equivalent) for 4” vent.

6. The water heater(s) shall use a commercial-grade copper, fin tube primary heat exchanger with quick release brass or bronze waterways. The secondary heat exchanger shall be constructed from stainless steel 316L.

7. The heater(s) shall be controlled by an on-board solid-state printed circuit board which uses the following factory installed components: thermistors to monitor water temperature and exhaust temperature; a flow sensor to measure flow rate; a fame sensor to monitor combustion; an Air-Fuel Ratio Rod to measure and adjust air input in order to maintain optimal combustion efficiency.

8. The heater also consists of in-line fusing and surge absorbers for electrical surge protection, an electronic spark igniter, aluminized stainless steel burners, hi-limit temperature switches to monitor water and exhaust temperatures, modulating gas valve, dual freeze protection that will automatically fire the heater (indoor model only) and use heating blocks to protect the heat exchanger, and an overheat cutoff fuse.

9. The heater(s) can manifold to link up to 4 heaters to provide additional capacity. The link controls shall be built onto the on-board solid state printed circuit board and does not require external controls. The linking control wire shall be supplied with the heater. The heater(s) can use a multi-unit controller, 100112691, to manifold 5-20 heaters. The link and multi-unit controller shall modulate the system for the most efficient performance. The link and multi-unit controller shall rotate the priority heater every 12 hours of operation time or 100 starts for balanced duty/cycle operation.

10. The heater models are design certified by CSA according to ANSI Z21.10.3 · CSA 4.3, approved for sale in the United States, ENERGY STAR® qualified, has a minimum uniform energy factor of 0.93, meets the energy efficiency requirements of the U. S. Department of Energy and ASHRAE

11. 90.1, complies with SCAQMD Rule 1146.2 and other air quality districts with similar requirements for low NOx emissions of 14 ng/J or 20 ppm, and shall be certifed to NSF 5 standards.

12. Factory-Installed, Appurtenances:

    a. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire tank except connections and controls.
    b. Jacket: Steel with enameled finish.
    c. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

13. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

    a. A. O. Smith, Water Products Company.
    b. Bradford White Corporation.
    c. Laars Heating Systems Co.
    d. Lochinvar LLC
    e. Noritz America
    f. Rheem Manufacturing Co.
    g. Takagi.

2.2 WATER HEATER ACCESSORIES

A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.

B. Inlet and outlet isolation valves

C. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

D. Vacuum Relief valve.

E. Condensate neutralizer as provided by manufacturer

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters on wall.

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install gas water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.

D. Install inlet and outlet valves as recommended by manufacturer.

E. Install combination temperature and pressure relief valves. Extend relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install thermometer on outlet piping of water heaters.

G. Install condensate neutralizer as recommended by manufacturer with drain piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

H. Fill water heaters with water.

3.2 CONNECTIONS

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, confirm proper operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

END OF SECTION 22 3436

SECTION 22 4200 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Faucets for lavatories,showers, and sinks.
2. Flushometers.
3. Drinking Fountains
4. Toilet seats.
5. Protective shielding guards.
6. Fixture supports.
7. Water closets.
8. Urinals.
9. Lavatories.
10. Individual showers.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. PMMA: Polymethyl methacrylate (acrylic) plastic.

D. PVC: Polyvinyl chloride plastic.

E. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements in ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities"**;** Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act" for plumbing fixtures for people with disabilities and Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

B. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

D. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Stainless-Steel Residential Sinks: ASME A112.19.3.
2. Vitreous-China Fixtures: ASME A112.19.2M.
3. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
4. Water-Closet, Flushometer Tank Trim: ASSE 1037.

E. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Supply Fittings: ASME A112.18.1.
11. Brass Waste Fittings: ASME A112.18.2.

F. Comply with the following applicable standards and other requirements specified for shower valves:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

G. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.
4. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Dishwasher Air-Gap Fittings: ASSE 1021.
3. Flexible Water Connectors: ASME A112.18.6.
4. Grab Bars: ASTM F 446.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Off-Floor Fixture Supports: ASME A112.6.1M.
7. Pipe Threads: ASME B1.20.1.
8. Plastic Toilet Seats: ANSI Z124.5.
9. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 Fixtures and Trim

A. Refer to the notes/schedule on the drawings for fixture and associate trim specifications.

B. All waste and supply trim exposed to view shall be chrome plated brass.

C. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bemis Manufacturing Company.
b. Centoco Manufacturing Corp.
c. Church Seats.
d. Kohler Co.
e. Olsonite Corp.
f. Beneke Div, Sanderson Plumbing Products, Inc..
g. Sperzel.

2. Description: Toilet seat for water-closet-type fixture.

a. Material: Molded, solid plastic with antimicrobial agent.
b. Configuration: Open front without cover.
c. Size: Elongated.
d. Hinge Type: self-sustaining check.
e. Class: Heavy-duty commercial.
f. Color: White.

2.2 FIXTURE CARRIERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Carriers:

1. Description: Combination carrier designed for wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with neoprene gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Urinal Carriers:

1. Description: Urinal carrier with hanger and bearing plates for wall-mounting, urinal-type fixture. Include rectangular steel uprights with feet.

D. Lavatory Carriers:

1. Description: Lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include rectangular steel uprights with feet.

E. Drinking Fountain Carriers:

1. Description: Carrier with hanger and bearing plates for wall-mounted fixture. Include rectangular steel uprights with feet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install feet and anchor lugs of carriers securely affixed to floor using all bolt holes provided.

C. Install fixtures level and plumb according to roughing-in drawings.

D. Attach supplies to supports or substrate within pipe spaces behind fixtures to prevent loose piping fitting piping thru walls. Install -supply stop on each water supply to each fixture connected to water distribution piping. Install stops in locations where they can be easily reached for operation.

E. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

F. Install toilet seats on water closets.

G. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

H. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

I. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Adjust flow regulators for proper flow and stream height and adjust water cooler temperature settings for drinking fountains.

F. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 4200

SECTION 23 0001 – BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Utilities
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Miscellaneous Equipment Connections
16. Equipment Selection
17. Shop Drawings
18. Final Inspection and Punch List
19. Operation and Maintenance Manuals
20. Record Drawings
21. Warranties
22. Project Closeout
23. Operation and Adjustment of Equipment
24. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this HVAC work.

C. A complete and functional HVAC system installation shall be provided under this Division. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

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.

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.

1.4 SCOPE OF WORK

A. The scope of the HVAC work includes furnishing, installing, testing and warranty of all HVAC work shown on the HVAC drawings and specified herein, including Division 00, Division 01, Division 23 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “proved,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having ductwork, pipe and fittings fabricated and delivered in advance of making actual measurements shall bet be sufficiently in advance as

to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

D. The Architect/Engineer shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.

E. Equipment, ductwork or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.

G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, dampers and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ADTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Refer to Section 017300 Execution.

B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. Except where the permit application is made by the Architect or the Engineer, the HVAC contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the HVAC work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities.

C. Include payment of all permit and inspection fees applicable to the work in this Division.

D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 TEMPORARY UTILITIES

A. The use of the permanent HVAC system for temporary heating and ventilation during the latter stages of construction shall be allowed. Expedite completion of system as practicable to this end. Maintain the system during this period. Provide and maintain temporary air filters to protect coils and ducts. Replace temporary filters with the specified filters (clean) when the systems are placed on permanent duty. Air filters specified for the systems and units, including specified spare filters, are not to be used for temporary service.

B. Cover all return duct openings with temporary filter media when recirculating air. Stop fans during heavy dust generating operations. Before turning the system over to the Owner, the Contractor shall clean duct interiors and interior surfaces and components with the air handling equipment if dirt, dust and debris have accumulated on these surfaces.

C. Warranty periods on equipment, materials and system shall commence upon Owner acceptance of the building or system. Temporary heat use shall not jeopardize or alter the warranty requirements.

1.12 WORKMANSHIP

A. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

B. HVAC work shall be performed by licensed HVAC Contractors in accordance with requirements of the jurisdiction.

1.13 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 23:

1. Ferrous metal which is not factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.

3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

4. Inside of ducts, behind grilles and registers, shall be painted flat black to eliminate the viewing of shiny surfaces.

B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.

C. Finish painting is included in the General Contract except where otherwise required under remodeling work. Refer to the “Cutting and Patching” paragraph in this Section for finishing requirements.

1.15 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on these surfaces.

D. Before placing each system in operation, the equipment shall be thoroughly cleaned; cleaning shall be in accordance with equipment manufacturer's recommendations.

E. Refer to appropriate Sections for cleaning of other equipment and systems for normal operation.

1.16 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturer’s listed.

2. Where the words “or approved equal: appear after a manufacturer’s name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words “equal to” appear, followed by a manufacturer’s name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer’s approval.

C. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

D. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.

E. If extensive changes in pipe, duct or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.17 SHOP DRAWINGS

A. One set of shop drawings, in electronic format (.pdf), with descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in Division 01. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.

B. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

C. The review of shop drawings by the Architect or Engineer shall not relieve the Contactor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer’s attention in a separate clearly stated notification at the time of submittal for the Engineer’s review.

D. Shop drawings for the following HVAC equipment and materials shall be submitted:
1. Vibration Isolators.
2. Ductwork Insulation.
3. Ductwork and Sealing Systems.
4. Air Duct Accessories.
5. Furnaces and Cooling Coils.
6. Condensing Units.
7. Refrigerant piping schematic and components.
8. Rooftop Heating and Cooling Units.
9. Fan-Coil Units.
10. Unit Heaters.
11. Central Air Handling Units.
12. Fans.
13. Air Filters.

14. Diffusers, Registers and Grilles.
15. Louvers.

1.18 FINAL INSPECION AND PUNCH LIST

A. As the time of work completion approaches, the Contractor shall survey and inspect his work and develop his own punch list to confirm that it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.

B. Requests to the Architect, Engineer or Owner for final inspection may be accompanied by a limited list of known deficiencies in completion, with appropriate explanation and schedule for completing these; this is in the interest of expediting acceptance for beneficial occupancy.

C. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completing or verification. Corrective action shall be taken by the Contractor to the satisfaction of Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.19 OPERATION AND MAINTENANCE MANUALS

A. One electronic copy of operating and maintenance manuals shall be assembled for the HVAC work by the Contractors.

B. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. Air and water balance reports shall also be included. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.

C. These shall be combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.20 RECORD DRAWINGS

A. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.21 WARRANTIES

A. This Contractor shall warrant all workmanship, equipment and material entering into this contact for a period of one year of date of final acceptance or date of beneficial use, as agreed to

between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

B. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer’s recommendations.

C. This provision shall not be construed to include maintenance items such as replacing filters, re-tightening or repacking glands, greasing, oiling belt tightening and cleaning strainers after these have been done for final close-out.

D. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

E. Extended warranties shall be provided where indicated in the equipment specification sections.

1.22 PROJECT CLOSEOUT

A. Refer to Section 017700 Closeout Procedures.

1.23 OPERATION AND ADJUSTMENT OF EQUIPMENT

A. As each piping system and air distribution system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing air and water systems, adjusting fan speeds, belts, pulleys, tightening packing glands, and adjusting all operating equipment.

B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician’s judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer’s specific instructions.

C. Test relief valves, air vents and regulating valves to insure proper operation.

1.24 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.

B. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 23 0001

SECTION 23 0513 - ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for electrical work for HVAC equipment including 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 and other electrical equipment, devices, fuses, wire, conduit and installation methods.

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.

B. Refer to the Mechanical drawings and also the Electrical drawings for requirements related to each trade. Coordinate all aspects of electrical components and wiring to complete the systems.

1.3 QUALITY ASSURANCE

A. Equipment, devices shall be designed, constructed and installed in accordance with applicable standards of NEMA and the National Electric Code. Equipment shall be tested and listed by UL or other approved agency and installed in accordance with all instructions included as part of such listing.

B. Electrical equipment, devices, fuses, wire, conduit and methods shall comply with applicable provisions of Division 26 - Electrical.

PART 2 - PRODUCTS

2.1 MOTORS

A. General duty motors shall be induction type 1750 rpm NEMA Design "B" with copper windings, Class B or F insulation, and motor enclosure to suit the application. Service factor shall be 1.15 minimum.

B. Motors for other than general duty application shall be furnished to suit the application and operating environment.

C. Premium efficiency motors shall be equal to Century “E + 3”, General Electric “Energy Saver Premium Efficiency”, Baldor “Super E Premium Efficient” or Reliance “Premium Energy Efficient” series. Motor efficiencies shall be tested and conform to NEMA Standard Publication MG-1 and IEEE 112 Test Method B.

D. Electronically Commutated Motors – Fans
   1. Motor enclosures: Open Drip Proof, Totally Enclosed Fan Cooled, per the application.
   2. Electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.
   3. Motors are permanently lubricated, heavy duty ball bearing type to match with the equipment load and pre-wired to the specific voltage and phase.
   4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor or integrated variable frequency drive.
   5. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.
   6. Motors can achieve up to 95% efficiency, model and horsepower dependent.

E. Motor sizes shown on the drawings are to be considered minimum. Motors furnished shall be sized so as to not operate in the service factor range. Motors for direct driven pumps and fans shall be selected so as to not operate in the service factor range at any point on the curve.

F. The HVAC Contractor and equipment suppliers shall compare the electrical power requirements of the intended equipment with power feeders to the equipment shown on the Electrical drawings. Verify adequacy and compatibility of voltage, phase, wiring, capacity, number and size of conductors (versus equipment connection points), fusing and other information on the electrical and mechanical drawings to that required for the equipment. If the selected equipment requires revision of the electrical, added cost must be borne by the HVAC Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. If a non-basis of design manufacturer is provided by the HVAC contractor and the specific unit has a powered component with a MCA and/or MOCP greater than the basis of design, the HVAC contractor shall be responsible to provide all required electrical changes required to power the non-basis of design unit. The HVAC contractor shall coordinate with the Electrical Contractor any variances in the MCA and/or MOCP of the units provided.

END OF SECTION 23 0513

SECTION 23 0530- EQUIPMENT BASES AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Concrete Bases
2. Structural Steel Supports

1.2 QUALITY ASSURANCE

A. Coordinate exact dimensions, locations, and other details for the specific equipment provided with other trades.

PART 2 - PRODUCTS

2.1 CONCRETE BASES

A. Concrete base pad with steel reinforcement as detailed on the drawings. Bases shall be formed on all sides and hand troweled to a smooth, dense finish with neatly chamfered corners. Large concrete pads on grade shall be constructed with reinforcing steel or reinforcing roadway mesh.

1. curb height shall be coordinated to achieve fan discharge 42” above roof deck.

2.2 STRUCTURAL STEEL SUPPORTS

A. Structural steel angles, beams, or channels, Unistrut channels, or pipe supports shall be fabricated into a rigid framework with welded or bolted connections and cross / sway bracing.

B. Supports shall be set of slab with baseplates or attached to permanent building structure.

C. Wall brackets shall be anchored to steel framing members or masonry walls.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof curbs shall be installed, shimmed level, and secured to the roof deck/structure. Roof insulation and roofing shall be installed around each curb by the Roofing Contractor.

B. Equipment Bracing & Attachment

1. All equipment and curbs exposed to wind shall be installed and attached to structure in strict accordance with the Wind Load Analysis design. Attachment shall conform to the applicable building codes and manufacturers installation instruction.

2. No rigid connections between equipment and the building shall be made that would degrade vibration isolation.

3. Each manufacturer of equipment shall furnish a statement stamped by a professional engineer indicating that the equipment is designed and constructed to withstand wind loads required by the building codes. Statement shall include supporting documentation, calculations, etc.

C. Attachment to manufactured trusses, joists, purlins, and other engineered structural members and supports shall be done in accordance with the structural engineer’s or manufacturer's recommendations. Refer to the architectural and structural engineer drawings for type of engineered structural system being used. Connections to these structural members shall be made with connection devices and methods approve by the structural engineer or manufacturer. Provide additional supports with supplemental steel shapes when spacing between structural members exceed specified distances. In cases of existing trusses, the structural engineer shall review and approve hanger attachment methods.

END OF SECTION 23 0530

SECTION 23 0548 - VIBRATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Vibration Isolators
    a. Hangers

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Indicate inertia bases and locate vibration isolators.

PART 2 - PRODUCTS

A. Hangers

1. Neoprene in Shear Hanger
    a. Element: Double deflection LDS rubber isolator color coded for load carrying capacity.
    b. Mason Industries Series “HD”.

2.2 MANUFACTURERS

A. Mason Industries.
B. Kinetics Noise Control
C. Amber Booth

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Isolators installed outside shall be furnished weather protected, with springs PVC coated, and other ferrous parts hot dip galvanized, or cadmium plated.

3.2 INSTALLATION

A. Follow manufacturer's instructions in setting and adjusting isolators. Ensure that no direct hard surface to surface contact occurs. Fasten device to floor as recommended by the isolation supplier.

B. Where electrical connections are to be made to equipment mounted on isolators, inform the Electrical Contractor to connect to the equipment with flexible conduits.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 0548

SECTION 23 0553 - IDENTIFICATION FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment Labels.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Each item or major equipment shall be labeled.

B. Labeling shall be:

1. Permanently attached engraved brass or plastic laminated signs with 1” high lettering. Signs on exterior equipments shall be brass.

2. Stencil painted identification, 2” high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel.

3. In addition to the labeling attached to each VAV terminal unit, provide a colored sticker on the ceiling grid below each VAV to mark it’s location.
4. lettering.

2.2 ACCEPTABLE MANUFACTURERS

A. Labels, markings and tags shall be manufactured by:
1. W.H. Brady
2. Seton
3. Allen
4. Industrial Safety Supply

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification marking and tagging shall be applied after insulation and painting has been completed.

B. Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled on drawings.

C. Equipment labeling shall consist of unit designation as shown on the drawings. Exhaust labeling shall also indicate service of room or area of service.

END OF SECTION 23 0553

SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide air and water balancing for the new and modified existing systems.

1.2 SUBMITTALS

A. Provide a certification sheet signed and sealed by the certified testing and balancing contractor.

B. Provide a list of instruments to be used for procedures and proof of calibration.

C. Submit plan for simulation of system diversity where required.

D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.3 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB.

B. Approved Balancing Contractors:

1. Kahoe
2. Air Balance Unlimited
3. American Air Balance
4. Airflow Pros

C. 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.

D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.” NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing.

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1.

F. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

G. Verify that all equipment start-up services have been completed before beginning any balancing work. Confirm all safety interlocks and protective devices are functioning and the system is ready to be balanced.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 AIR BALANCE

A. Examine approved submittal data of HVAC systems and equipment.

B. Obtain job specific fan curves for each fan being balanced, new and existing. Include fan curves in final report.

C. Record nameplate data from fans, motors, air handling equipment etc.

D. Record and measure fan and motor sheaves indicating number and size of belts along with center to center distances.

E. Test and record fan operating rpm, and record running amperage.

F. Each air supply, return and exhaust system shall be set in operation. Determine the best location in main and branch ducts for accurate duct airflow measurements. Each air outlet and inlet device, item of equipment (fan coils, air control units, etc), shall be balanced to the quantities listed on the drawings within plus or minus 10%, except where more stringent requirements are required as defined below. Central fan systems (AHU's, exhaust fan systems etc.) shall be balanced to within plus or minus 5%.

G. Rooms requiring positive or negative pressure relationships shall be tested and logged.

H. Adjust drive/ECM fan speeds or drive pulleys to attain the required fan speed. Pulleys and belts of fixed drives and of adjustable drives not having sufficient adjustment range shall be changed out, at the direction of the balancer or Engineer, to obtain fan speed required. All labor and materials to make the recommended changes shall be including in the Div. 23 scope of work.

I. Measure velocity reading across coils, filters, and dampers on the intake side of the fan. Include data in the report.

J. Coordinate with the Temperature Controls contractor in setting the supply, return, and exhaust fans ECM controllers and outside air, return air and relief/exhaust air dampers. Supply air systems shall have ampere reading measured in the full heating, full cooling and economizer modes to determine the maximum brake horsepower.

K. Witness all duct pressure and leakage tests. Refer to 23 3113 and coordinate accordingly.

L. Total air quantities of the supply, return and exhaust fans shall be determined by pitot tube traverse. Where impossible to take accurate pitot tube traverses of the duct systems, the total sum

of terminal device air volume readings may be used. Final settings of fan speeds shall be determined with ECM controllers at full speed.

M. For variable air volume systems with diversified air flow rates, develop and implement a plan to simulate diversity.

N. Check for proper sealing of air-handling unit components. Report all issues in the balancing report.

O. Check for proper duct sealing. Minor issues shall be reported in the balancing report. If a major issue is found, stop balancing work and report the issue to the CM and Engineer.

P. In balancing of variable air volume systems, the total air quantity of the devices generally exceeds the fan air quantity due to the nature of VAV systems. The fan speed shall be set to deliver the required maximum fan cfm with duct static pressure sufficient for proper operation. Terminal control units shall be positioned for fan balancing to deliver the maximum fan air flow rate. When dual minimum control sequences are specified, set up the heating and cooling minimums.

Q. Balancing of terminal air control units and air devices shall be done to provide adequate but not excessive pressure in the branch ducts to air control units and air devices. Dampers in air device duct runouts shall be used as the secondary balancing means when other branch dampers are provided. Check, test and calibrate as required all terminal air control unit cfm settings (maximum and minimum).

R. Mark equipment and balancing device setting with paint or other suitable permanent identification, including damper control positions, valve position indicators, fan speed controls and similar control devices. Record and list terminal unit K-Factors.

3.2 FINAL REPORT

A. After completion of the balancing work, a full report shall be prepared in pencil, electronically submitted to the engineer for review. After review, additional balancing adjustments, drive replacements, readings and recordings deemed necessary shall be done and the report revised. An electronic copy of the final report shall be submitted to the engineer for review and approval. An approved copy of the report shall be included in the Operating and Maintenance manual.

B. The report shall also include

1. Table of Contents
2. Notes explaining why certain final data in the report varies from indicated values.
3. Pump Curves
4. Fan Curves
5. Final K-Factors on each terminal unit.

END OF SECTION 23 0593

SECTION 23 0713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Fiberglass.

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated:
   a. Thermal performance ratings.
   b. Thickness and covering table.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting 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 and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 GENERAL

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

2.2 INSULATION MATERIALS

A. Refer to ‘Ductwork Insulation Schedule’.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Workmanship – Installation shall be done by tradesmen specializing in insulation work in strict accordance with manufacturer's recommendations.

B. Duct Sealing – Ductwork joints shall be sealed prior to installation of insulation.

C. Duct Supports – Duct insulation shall be installed around ductwork supports where moisture may condense on surface of cold ductwork in direct contact with supports. Extend past edge of ductwork 4” for trapeze style supports.

D. Performance Markings – Insulation shall be marked with manufacturer, “R-Value”, and flame spread and smoke development.

E. Blanket Insulation –
   1. Blanket insulation shall be wrapped tight to the duct.
   2. Insulation shall be secured to ducts 20” wide and greater with weld pins and fasteners, 18” on center maximum.
   3. Adhesive shall be applied to the duct as an aid to installation and adhesion.
   4. Vapor barrier jacket shall be lapped, stapled and sealed with adhesive and 3” wide FSK pressure sensitive tape.

F. Board Insulation –
   1. Insulation with factory applied jacket shall be secured to the duct with weld pins and fasteners, 12” on center maximum.
   2. Vapor barrier jacket shall be lapped, stapled and sealed with adhesive and 3” wide ASJ pressure sensitive tape.

G. Duct Accessories Insulation – Equipment and devices in supply ductwork which could potentially condense moisture shall be insulated.

H. System Identification – Install markings for service and flow direction for each ductwork system on ductwork insulation. Refer to Section 23 0553 “Identification for HVAC Systems”.

END OF SECTION 23 0719

SECTION 23 2300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

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. 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.

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

D. The equipment manufacturer shall provide piping installation instructions to the Contractor and supervision as needed to insure that the piping system is installed in accordance with the equipment manufacturer’s recommendations.

1.4 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-32:

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.

B. Line Test Pressure for Refrigerant R-454b:

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.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube
1. Hard Copper Tube: ASTM B280 Type “ACR” hard, seamless copper thoroughly cleaned and dehydrated for use with the refrigerant used. Tubing which has not been so prepared and sealed or which has been open to the atmosphere for any length of time shall not be used.
2. Fittings: ASME B16.22 wrought-copper fittings.
3. Brazing Filler Metals: AWS A5.8/A5.8M silver brazed joints.

B. Copper Coil
1. Soft Copper Coil Piping: ASTM B280-20/B1003-16 Type C12200 coiled, seamless copper thoroughly cleaned and dehydrated for use with the refrigerant used. Tubing which has not been so prepared and sealed, or which has been open to the atmosphere for any length of time shall not be used.
2. Fittings: ASME B16.22 wrought-copper fittings.
3. Brazing Filler Metals: AWS A5.8/A5.8M silver brazed joints.

2.3 VALVES AND SPECIALTIES

A. Refrigerant devices specified below shall be specifically designed for the refrigerant application and of construction pressure class consistent with the duty imposed.

B. Manual Shutoff Valves:

1. Brass construction with sweat ends. Valves shall be ball type or may be packed type with backseating construction or pack-less type.

C. Service Valves:

1. Shutoff type with charging and test ports.

D. Solenoid Valves:

1. Brass body, sweat ends, normally closed with manual lift stem and holding coil in a NEMA 1 enclosure, voltage to match controls.

E. Thermal Expansion Valves:

1. Thermostatically operated diaphragm type with brass body, external equalizer and external superheat adjustment.

2. Expansion valves shall be manufactured by:
   a. Alco
   b. Sporlan

F. Hot Gas Bypass Valves:

1. Pilot operated modulating regulators with integral solenoid pilot assembly and external equalizer tubing and connections.

2. Hot Gas Bypass valves shall be manufactured by:
   a. Alco FA8
   b. Sporlan

G. Flexible Pipe Connectors:

1. Corrugated copper bellows type with woven bronze wire protective jacket suitable for 535 psi refrigerant use.

H. Filter Dryers:

1. Sealed type or replaceable core type equal to Sporlan “Catch-All”.

2.4 REFRIGERANTS

A. ASHRAE 34, R-32: Difluoromethane (methylene fluoride)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arkema Inc.
   b. DuPont Fluorochemicals Div.
   c. Genetron Refrigerants; Honeywell International Inc.
   d. Mexichem Fluor Inc.

B. ASHRAE 34, R-454B: Difluoromethane/2,3,3,3-tetrafluoro-1-propene

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arkema Inc.
   b. DuPont Fluorochemicals Div.
   c. Genetron Refrigerants; Honeywell International Inc.
   d. Mexichem Fluor Inc.

PART 3 - EXECUTION

3.1 SCHEDULE

A. Piping from Outdoor AC/Heat Pump unit to indoor fan coil unit – Type R2

3.2 INSTALLATION

A. Drawing plans, 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.

B. Install refrigerant piping according to ASHRAE 15.

C. All joints shall be brazed using silver solder while flowing an inert gas such as dry nitrogen through the piping.

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. Piping shall be hung from the building structure with copper or plastic coated clevis hangers and steels rods as described in 230529 Pipe Hangers and Supports. Hangers for insulated pipe shall be oversized and a sheet metal saddle with belled ends incorporated to protect the insulation.

F. 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.

G. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

H. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

I. Service valves shall be provided on the condensing unit liquid and suction connections/compressor suction and hot gas connections/condenser hot gas and liquid connections if not furnished on the unit.

J. A solenoid valve, a sight glass-moisture indicator and a thermostatic expansion valve shall be provided for each evaporator coil circuit. A filter dryer shall be provided in each liquid line near the condensing unit or the evaporator coil. A shut off valve shall be provided on both the inlet and outlet of a replaceable core filter-dryer.

K. Hot gas bypass valve assembly shall be provided on the first stage of capacity control/for each compressor where lead-lag selection is incorporated and as indicated. Hot gas piping shall be run from the compressor discharge to the refrigerant distributor of the evaporator coil and the equalized line extended to the suction header.

L. Flexible pipe connectors should be provided where recommended by the equipment manufacturer.

M. Solenoid valves shall be mounted within the enclosure of outdoor equipment or otherwise protected from weather.

3.3 CLEANING

A. Before installation of refrigerant piping, clean pipe and fittings using the following procedures:
1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

3.4 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.

3.5 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. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 2300

SECTION 23 3113 - DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct Materials
2. Rectangular Ductwork
3. Single Wall Round and Flat Oval Ductwork
4. Double Wall Round and Flat Oval Ductwork
5. Duct Liner
6. Branch Duct Connectors
7. Sealants and Gaskets
8. Hangers and Supports

B. Related Sections:

1. Division 23 Section 0713 "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
3. Division 23 Section 0713 “Duct Insulation” for insulation and duct liner products.

1.2 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.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation techniques.
2. Factory- and shop-fabricated ducts and fittings.
3. Reinforcement and spacing.
4. Seam and joint construction.
5. Duct Liner
6. Duct Connectors

7. Duct Sealants and Gaskets
8. Penetrations through fire-rated and other partitions.
9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

A. Refer to ‘Ductwork Systems Schedule’ on drawings.

2.2 RECTANGULAR DUCTWORK

A. Construction
1. Single wall factory- or shop-formed continuous helical (spiral) lock seam.

B. Joints/Seams

1. Butt Joints
   a. Flanged System – Equal to Ductmate Industries “25 and “35” Adhere strictly to manufacturer’s instructions.
   b. Slip & Drive connections
2. Seams
   a. Pittsburgh Lockseam

C. Fittings/Transitions – Shall conform to SMACNA Figure 2-7.
1. Transition angles shall be limited to 30 degrees on converging transitions and 20 degrees on diverging transitions.
2. Elbows – Fittings shall have an inside radius equal to the duct width. 90-degree elbows shall be square with double wall turning vanes. Elbows less than 90 degrees shall be

radiused. Non-radiused elbows less than 90 degrees, with or without turning vanes are not permitted.

3. Branch take-offs, where not detailed otherwise, shall be with a static boot (45-degree clinch collar) per SMACNA Figure 2-6 or conical spin-in fitting. Straight tap take-offs are not permitted.
4. Square throat, radius heel 90-degree elbows are not permitted.
5. Radiused, angled (15° Max.), or Mitered (15° Max.) offsets.
6. Concentric Transitions, $\theta = 45°$ Max.
7. Eccentric Transitions, $\theta = 30°$ Max.

2.3 SINGLE-WALL ROUND AND FLAT OVAL DUCTWORK

A. Medium Pressure Applications (2" S.P. and higher).

1. Construction
   a. Single-wall factory- or shop-formed continuous helical (spiral) lockseam.

2. Joints/Seams
   a. Butt Joints
      1) Slip connections with EPDM or neoprene gaskets equal to McGill Airflow #Uni-Gasket.
      2) Flanged system with EPDM or neoprene gaskets equal to McGill Airflow #Uni-Flange.
   b. Seams
      1) Spiral lockseam

3. Fittings/Transitions – Shall be compatible with duct system.
   a. 90-Degree Branch tees shall be streamlined, spin-in conical type with Y branches.
   b. 45-Degree lateral tee wherever possible.
   c. Die-stamped elbows, r/D = 1.5 (minimum).
   d. Radiused, angled (15° max.) or mitered (15° max.) offsets.
   e. Concentric transitions, $\theta = 45°$ max.
   f. Eccentric transitions, $\theta = 30°$ max.

B. Low Pressure Applications (1" S.P. or less).
1. Construction
   a. Single-wall factory- or shop-formed continuous helical (spiral) lockseam.

2. Joints/Seams
   a. Butt Joints
      1) Slip connections with EPDM or neoprene gaskets equal to McGill Airflow #Uni-Gasket.
      2) Flanged system with EPDM or neoprene gaskets equal to McGill Airflow #Uni-Flange.
   b. Seams –
      1) Spiral lockseam
      2) Round Ductwork: Longitudinal seams may be utilized for 1" and less (positive and negative) static pressure construction class at final air devices.

3. Fittings/Transitions – Shall be compatible with duct system.

a. Factory- or shop-formed and welded.
b. Elbows shall be long radius type.
c. Elbows for longitudinal seam round ductwork shall be factory- or shop-formed segmented standing seam or pleated. Other fittings shall be comparable to the elbows.
d. Round Ductwork Additional Provisions:
    1) Standard tees allowed.
    2) Segmented elbows allowed.

2.4 DOUBLE-WALL ROUND AND FLAT OVAL DUCTWORK

A. Construction:
1. Double-wall insulated ductwork with acoustic perforated liner, thickness per 'Ductwork Insulation Schedule' on the drawings.

B. Joints/Seams:
a. Butt Joints
    1) Slip connections with EPDM or neoprene gaskets equal to McGill Airflow #Uni-Gasket.
    2) Flanged system with EPDM or neoprene gaskets equal to McGill Airflow #Uni-Flange.
b. Seams
    1) Spiral lockseam

C. Fittings:
1. Double wall to single wall transitions shall be provided where flat oval and single wall round ducts connect.
2. Fittings shall utilize a solid inner liner.
3. 90-Degree branch tees shall be streamlined, spin-in conical type with Y-branches.
    a. Branch fittings from oval main duct shall be lateral round taps located on the minor axis and shall be at no less than a 45° angle.
4. 45-Degree lateral tee whenever possible.
5. Die-Stamped elbows, R/D = 1.5 (Min.).
6. Radiused, angled (15° Max.), or Mitered (15° Max.) offsets.
7. Concentric Transitions, $\theta = 45°$ Max.
8. Eccentric Transitions, $\theta = 30°$ Max.

2.5 BRANCH DUCT CONNECTORS

A. Round duct branch connection to rectangular sheet metal duct

1. Conical flanged press-on or spin-in connector with manual damper for branch ducts to air devices.

2. Damper: Single Blade with heavy duty quadrant locking handle. Provide shaft stand-off for insulated duct systems. Stand-off depth per duct insulation thickness.

2.6 SEALANT AND GASKETS

A. Duct sealant materials shall be:

1. Water based synthetic latex emulsion duct sealant equal to Ducmate PROSeal.
   a. No V.O.C.'s
   b. UL 181B-M Listed, UL 723 classified
   c. For applications up to 15" w.g.
   d. Gray Color

B. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

A. Strap and Rod Sizes / Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

B. Strap Hangers:

1. Strap hanger material shall match that of the ductwork it is supporting.

2. Structure Connections
   a. Steel Construction:
      1) Loop strap around
   b. Concrete Construction:
      1) Concrete Structure Shot Fire Attachment
      2) Pre-Set Concrete thread attachment
      3) Drilled expansion anchor.
   c. Wood Construction
      1) Lag Bolt – Min. 2" Length
   d. Cold Rolled Steel Construction
      1) Sheet Metal Screw

C. Hanger Rods

1. Noncorrosive Environments: Cadmium-plated steel rods and nuts.
2. Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
3. Structure Connections:
   a. Steel Construction: Threaded Rod Universal C-Type Clamp: Equal to Anvil Fig. 92.
   b. Concrete:
      1) Pre-Set Concrete thread attachment
      2) Drilled threaded expansion anchor
   c. Wood Construction
      1) Vertical threaded rod anchor: Equal to Sammy 1/4" x 2"
   d. Cold Rolled Steel Construction
      1) Threaded retaining nuts and washers, both sides of steel.
4. Provide swivel attachment for hanger rods anchored to angled construction. Equal to Anvil #AF777.

D. Steel Cables
1. Product equal to Gripple No. 3 or No. 4 cable.
2. Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
3. Stainless-Steel Ducts: Stainless steel complying with ASTM A492.

E. Steel Cable End Connections - Assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

1. Cable End Fitting: Equal to Gripple #LG, #LS, or #HG
2. Cable Locking Fastener: Equal to Gripple #HF
3. Rectangular Ductwork Trapeze Hanger: Equal to Gripple #DT2.
4. Trapeze Hanger: Equal to Gripple #TZ3.
5. Beam or Purlin Clamp: Equal to Gripple #GCB.
6. Wood Truss Eyelet: Equal to Gripple #EYQG.
7. Concrete Structure Shot Fire Attachment:
   a. General Concrete Structure: Equal to Gripple #SF35.
   b. Post Tensioned Concrete: Equal to Gripple #C945 or #NZ90.
8. Cold Rolled Steel 90-Degree Eyelet: Equal to Gripple #EY90*G.
9. Metal Deck Insert: Equal to Gripple #MDI-Y
   a. Pre-install prior to concrete pour.

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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
1. 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.

2. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

B. Ductwork Coordination

1. General Coordination – Coordinate duct layout carefully with other trades to avoid conflict with structural elements, lighting and plumbing- heating piping. Flattening of

ductwork and offsets to fit ductwork in available space is generally shown. In the absence of such, the Contractor shall arrange the ductwork to maintain concealment and allow ceilings and lights to be installed as intended. Do not hang ductwork until possible interferences with electrical and mechanical trades have been resolved. Having ductwork fabricated and delivered in advance shall not be justification for interference with other trades.

C. Joints & Seals

1. Transverse joints and longitudinal seams shall be assembled with sealant to conform to SMACNA Class B seal. Selection of sealant materials shall be compatible with the application. Sealants shall be applied in accordance with the manufacturer's recommendations.
2. Exterior ductwork shall be sealed with mineral impregnated fiber tape. Ductwork shall be supported as noted or detailed on the drawings.
3. System Pressure Testing – Ductwork systems operating at 3" S.P. or greater (positive or negative) and all exterior ductwork shall require duct pressure testing.

D. Hangers, Straps, & Supports – Attachment of hangers, straps, and supports to the structure shall be as follows:

1. Refer to Duct Hanger & Support detail on drawings for structural connection types and details as well as connection to ductwork.

2. Provide swivel attachment for threaded rod hangers mounted to angled structure.

3. Steel cables are permitted to loop through joist structure.

4. Unistrut Channel – Unistrut type channel support systems permitted to support any size ductwork. Channels should be attached to the structure with inserts or clamps. Utilize threaded rod or steel cable and appropriate attachments with channels as required.

5. Attachment to metal decking that does not contain concrete above is prohibited. In those instances, hanger connections shall be to steel structure with supplemental unistrut members where needed.

6. Attachment to wood decking is prohibited. Connections shall be made to wood joists / beams only.

7. Manufactured Truss and Flexicore Structure Coordination – Attachment to manufactured trusses and other engineered structural members and supports shall be done in strict accordance with the structural manufacturer's recommendations. Refer to the architectural and structural drawings for types of engineered structural systems utilized. Connections to these structural members shall be made with connection devices and methods approved by the structural manufacturer. Provide additional support with supplemental steel shapes when spacing between structural members exceeds specified distances.

8. Supplemental Steel - Supplemental steel shapes intended for ductwork support are to be provided by the H.C.

E. Duct Routing and Penetrations

1. General Coordination – Coordinate openings required for the passage of ductwork through walls, partitions, floors and roofs with the General Contractor. Openings shall be oversized to allow continuous insulation through the penetration.

2. Electrical Coordination – Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures. Ductwork shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment in accordance with NEC.

3. Cutting – Cutting of the existing structure i.e. roof, walls, floors, etc. shall be by the HVAC Contractor.

4. Wall Penetrations
   a. Non-Fire-Rated Penetrations – 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.
   b. Fire-Rated Penetrations – Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers where required or fire seal perimeter of duct when no damper is required. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

5. Structural Support for Penetrations –Supplemental steel structural members required to support penetration openings in the structure for ductwork shall be provided by:

F. Duct Protection & Cleaning

Protect duct interiors from moisture, construction debris and dust, and other foreign materials by covering each open end of the duct with visqueen secured with duct tape before the end of each day's work.

G. Duct Connectors

1. Connectors shall not be installed on transition or elbow fittings.
2. Connector press-on flanges shall not overlap edge of ductwork. Duct height must be tall enough to accommodate entire flange diameter. Utilize spin-in type for limited height conditions.

H. Painting
1. Where interior duct surfaces are visible through grilles, registers, diffusers and louvers, the inside of the duct shall be coated with flat black paint before the device is installed, to eliminate obtrusive appearances.
2. All exposed ductwork not installed with insulation in finished shall be paint ready with final painting by the GC.

END OF SECTION 23 3113

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Air Control Dampers & Accessories
    a. Manual Balancing Dampers
2. Pressure Differential Gauges
3. Turning Vanes
4. Duct-Mounted Access Doors
5. Flexible Connectors
6. Flexible Ducts

B. Related Sections:

1. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.
2. Division 23 Section “Ductwork” for ductwork materials, requirements, and schedules.
3. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, 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. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
    d. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

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.

PART 2 - PRODUCTS

2.1 AIR CONTROL DAMPERS & ACCESSORIES

A. MANUAL BALANCING DAMPERS & ACCESSORIES

1. Steel Rectangular Dampers

    a. Construction
        1) General – Single cross-blade up to 12 blade widths and in larger sizes, multiple blade type 6" maximum width with opposed blade arrangement.
        2) Frame – 16 ga., galvanized steel hat channel with reinforced corners
        3) Blades – 14 ga., galvanized steel, one piece airfoil shape, opposed blade. Synthetic blade edge seals.
        4) Jamb Seals – 300 Series stainless steel cambered compression type.
        5) Linkage – Out of airstream steel assembly
        6) Leakage Class – Class 1A

    b. Manufacturers
        1) Ruskin CD60 or approved equal by:
        2) Greenheck
        3) Nailor
        4) Pottorff

2. Steel Round Dampers

    a. Construction
        1) General – Single blade design.
        2) Frame – 20-ga. galvanized steel.
        3) Blades – 20-ga. galvanized steel.
        4) Control Shaft – Square axle shaft.
        5) Max Velocity – 1500 fpm.

    b. Manufacturers
        1) Ruskin #MDRS25 or approved equal by
        2) Greenheck
        3) Nailor
        4) Pottorff

3. Damper Adjustment Handle

    a. Construction
        1) General – Locking quadrant positioner with handle
        2) Handle – Heavy gage steel handle to accept square rod.

    b. Schedule
        1) Uninsulated ductwork – Ventfabrics "Ventlock" #641

2) Externally insulated ductwork – Ventfabrics #644

c. Manufacturers
   a) Ventfabrics
   b) Duro Dyne
   c) DynAir

2.2 PRESSURE DIFFERENTIAL GAUGES

A. Pressure differential gauges for air filter application shall be dial type gauges. Range shall be appropriate for the application. Gradations shall read in inches w.c.

B. Each gauge shall be furnished with vent valves, aluminum or plastic tubing, static pressure tips and mounting bracket or flange.

C. Manufacturer
   1. Dwyer "Magnehelic" Series 2000 or approved equal.

2.3 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Manufactured 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.

   1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. 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."

E. Vane Construction: Single wall for ducts up to 36 inches wide and double wall for 36” wide and larger dimensions.

2.4 DUCT-MOUNTED ACCESS DOORS

A. Duct Access Doors – Doors shall be factory fabricated with following characteristics:

1. Construction Material – Constructed of the same material as the ductwork system served (except galvanized sheet metal for fiberglass duct).
2. Door Thickness – Doors located in:
   a. Insulated ductwork (internal and/or external) shall have double-wall insulated doors, thickness as required per the insulation schedule.
   b. Uninsulated ductwork shall have single-wall construction.
3. Hinge – Continuous Piano Hinge. 1.5" wide steel construction, zinc plate.
   a. Ventfabrics #Ventlok 157 or equal.
4. Latches – Provide the following type of latch for each application:
   a. Low pressure ductwork (1" w.c. or less) – Cam lock type latches.
   b. High Pressure ductwork (greater than 1" w.c.) – Heavy duty handle type latches.
5. Frame & Seal – Frame and neoprene gasket between door and frame.
6. Size – Access doors shall be 18" x 16" minimum except smaller where duct size will not permit such size.
7. Pressure Application – Access doors and panels shall be designed to provide tight seal commensurate with the duct system operating pressure. Apply duct sealer or rubber gasket between frame and duct and on ducts of 3" S.P. and higher construction class, mechanical fastening of the frame and rubber gasket shall be provided.
8. Removable Sash Access Door – Where sufficient clearance is not available to allow the door to swing open 90 degrees or for round ductwork, a removable access panel with neoprene gasket, frame and cam lock latches on all four sides shall be provided in lieu of the hinged door.

2.5 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. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 30 oz./sq. yd.
2. Net Fabric Width: 4" wide.
3. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
4. Service Temperature: Minus 40 to plus 200°F.

E. 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. Net Fabric Width: 4" wide.
3. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.

4. Service Temperature: Minus 50 to plus 250°F.

2.6 FLEXIBLE DUCTS

A. Insulated Flexible Duct – For use with ductwork systems requiring insulation.
   1. Construction – Galvanized steel spiral wire mechanically locked to an airtight aluminum or polyester inner core, 1" thick 3/4 lb. density fibrous glass insulation and a polyethylene or reinforced metalized vapor barrier outer jacket.
   2. Pressure Rating – Duct shall be rated at a minimum of 6” w.g. positive and 4" w.g. negative static pressure
   3. Certifications – Shall be listed as Class 1 Air Duct or Air Duct Connector with 25-50 flame-smoke ratings per UL181 and comply with NFPA 90A.
   4. Manufacturer – Flexmaster USA Type 5 or 5M or approved equal.

B. Non-Insulated Flexible Duct – For use with duct systems not specified to be insulated, with similar restriction stated above.
   1. Manufacturer – Flexmaster USA #5NI-C or approved equal.

C. Flexible duct shall be used at final connections to air control terminal units and ceiling air diffusers except as limited in Part 3.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

1. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

2. Materials – Install duct accessories of materials suited to duct materials use:
   a. Galvanized-steel accessories in galvanized-steel and fibrous-glass ducts,
   b. Stainless-steel accessories in stainless-steel ducts,
   c. Aluminum accessories in aluminum ducts,
   d. Or as noted above.

B. VOLUME DAMPERS

1. Locations:
   a. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts.
   b. Install volume damper upstream/downstream of each supply, return or exhaust air device, register or grille.
   c. Volume dampers shall be in accessible locations for testing, balancing, and adjusting purposes. Coordinate with reflected ceiling plans.
2. Lined Ductwork – 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.

3. Install steel volume dampers in steel ducts.
4. Install aluminum volume dampers in aluminum ducts.
5. Set dampers to fully open position before testing, adjusting, and balancing.

C. PRESSURE DIFFERENTIAL GAUGES

1. Install air filter pressure differential gauges in a readable location on or near the air handling unit, filter housing or as otherwise indicated on the drawings.

D. ACCESS DOORS

1. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

   a. On both sides of duct coils.
   b. Upstream / and downstream from duct filters.
   c. At outdoor-air intakes and mixed-air plenums.
   d. At drain pans and seals.
   e. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
   f. Adjacent to and close enough to fire or smoke 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.
   g. For control devices requiring inspection.
   h. Elsewhere as indicated.

2. Install access doors with swing against duct static pressure to ensure closure.

3. Label access doors according to Division 23 Section "Identification for HVAC System" to indicate the purpose of access door.

E. FLEXIBLE CONNECTORS

1. Location: Install flexible connectors to connect ducts to equipment.

2. For fans developing static pressures of 5-inch w.g. and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

F. FLEXIBLE DUCTS

1. Connect flexible ducts to metal ducts with Panduit straps or stainless-steel clamps. End of the insulation and jacket shall be sealed to the metal duct with double wrapped duct tape. Maximum length of flexible duct shall be:

   a. Terminal units to supply ducts – 3 ft.
   b. Air devices to ducts – 7 ft.

2. Flexible duct installation locations:
   a. Shall be installed:
      1) At final air devices above accessible ceilings.

   b. Shall *not* be installed:
      1) Where ductwork is exposed.
      2) Above inaccessible ceilings – coordinate with reflected ceiling plan.
      3) Through any wall, ceiling, floor, or fire rated assembly.
      4) In the immediate vicinity of, and connecting to, air devices in fire rated ceilings where the assembly details require steel ductwork.

END OF SECTION 23 3300

SECTION 23 3400 - FANS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Inline Square Centrifugal Fan.

B. Related Sections

   1. 23 0513 Electrical Requirements for HVAC Equipment
   2. 23 0548 Vibration Control

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

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.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Fans shall be constructed, rated and labeled in accordance with AMCA Standard 210-67. Fans shall be statically and dynamically balanced throughout the operating range.

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. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

E. ASHRAE 90.1 Section 6 “Heating, Ventilating, and Air Conditioning”.
   1. Fractional Horsepower Fan Motors – Motors 1/12 hp or greater and less than 1 hp shall be electronically commutated motors (ECM).

PART 2 - PRODUCTS

2.1 GENERAL

A. Fans shall be provided as specified below and shown on the drawings, complete with motors, drives and associated devices.

B. All fans of any one listed type shall be of the same manufacturer.

C. Drives - All fans shall be direct drive. Fans with motors 1/12 hp or greater and less than 1 hp shall be ECM type. Fans greater than 1 hp shall be provided with a VFD, either integral to fan or shipped loose for remote installation.

D. Motor HP shall be sufficient to handle the full load of the fan, including drive losses, at the selected condition without exceeding the motor rating. In no case shall the motor size be less than shown without prior approval from the Engineer. All motors 1 HP and larger shall be “premium efficiency” series. Motors which are fed from variable frequency drive controllers for variable speed operation shall be designed and constructed for VFD drive duty and shall be compatible with the controller specified in Section 23 0531 Equipment Drives. Refer to Section 23 0513 Electrical Requirements for HVAC Equipment.

E. Motorized backdraft dampers, where specified, shall be furnished with a 120V actuator. Refer to HOA controller details on HVAC drawings for additional information.

F. All fans shall be provided with a Hand/Off/Auto controller from the unit manufacturer.

2.2 MOTORS

A. Refer to Section 23 0513 - Electrical Requirements for HVAC Equipment

2.3 INLINE SQUARE CENTRIFUGAL FAN

A. Construction – Backward inclined fan wheel, direct drive ECM motor, as indicated, motor disconnecting means and inlet cone. Housing shall be constructed of square galvanized sheet metal with 1” acoustical lining.

B. Mounting – Mounting brackets with neoprene vibration isolators for suspension mounting.

C. Direct drive units shall have motor out of the air stream and be furnished with a solid state speed controller with off position, and cover plate. The speed controller shall be turned over to the Electrical Contractor for installation.

D. Finish – The exterior of the fan shall be galvanized/factory primed and painted.

E. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:

1. Cook
2. Greenheck

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fans and roof curbs level and plumb, in accordance with manufacturer's written instructions.

B. Support units as described below using the vibration control devices specified in Section 23 0548 Vibration Control.

1. Suspended unit: Suspend unit from structural steel support frame using threaded steel rods and vibration isolation springs.

C. Arrange installation of fans to provide access space around fans for service and maintenance.

D. Adjust damper linkages for proper damper operation. Motorized backdraft dampers are to be wired by the Electrical Contractor to open when the fan operates.

E. Perform the following operations and checks before start-up.

1. Remove shipping blocking and bracing.

2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork and electrical are complete. Verify proper thermal overload protection is installed in motors starters and disconnects.

3. Verify proper motor rotation direction and verify fan wheel free rotation and smooth bearings operations. Align belts and reinstall belt guards.

4. Lubricate bearings, pulleys, belts and other moving parts with factory-recommended lubricants.

5. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in the full open position.

END OF SECTION 23 3400

SECTION 23 3713 - DIFFUSERS, REGISTERS, GRILLES, & LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grilles
2. Registers
3. Diffusers
4. Louvers

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, grilles, and return air canopies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

A. Air outlet and inlet devices shall be equal to those specified by catalog number and description in the schedule on the drawings. Damper operators shall be concealed screw type. An auxiliary mounting frame shall be furnished with each grille and register except those mounted on exposed ducts or in lay-in application.

B. Linear “T” bar air supply diffusers shall be slotted diffusers with fixed air pattern control complete with a galvanized sheet metal supply plenum having a round or oval duct connection and 1/2” neoprene coated fiberglass insulation on the interior. The unit shall be designed to mount on or alongside the ceiling “T” bar and shall include flanges on both sides of the diffuser to support the ceiling tiles. Additional “T” bars matching those of the ceiling system shall be provided by the HVAC Contractor if the diffuser does not have these flanges. Units shall have a center notch where required to accommodate intervening “T” bars.

C. Manufacturers:
   1. Price
   2. Titus

2.2 LOUVERS

A. Louvers shall be exterior weatherproof-type equal to those scheduled and shown on the drawings. Louvers shall be assembled entirely by welding. Louvers shall withstand uniform wind loading pressure of 20 psf. Performance data indicating pressure loss and water penetration, derived from AMCA 500 testing, shall be included with submittals.

   1. Aluminum Louvers
      a. Construction – Extruded 12 ga. aluminum frame and drainable, stationary blades.
      b. Finish – R1 caustic etch and finished with Kynar 500 (or equivalent) fluoropolymer finish.. Factory prime coated and will be finish painted by the General Contractor.

   2. Accessories – Bird screen shall be ½" square mesh aluminum wire on the interior face of the louver attached at 12" centers on the perimeter.

B. Manufacturers:

   1. Airolite
   2. Greenheck
   3. Pottorff
   4. Ruskin

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ceiling System Verification – The Contractor shall be responsible for comparability of ceiling mounted devices with the ceilings and suspension systems (lay-in, concealed spline, plaster, drywall, etc.). Verify with architectural drawings. Provide appropriate mounting frames.

B. Alignment and Supports – Carefully align square and rectangular devices with the vertical and horizontal building lines. Diffusers shall be attached rigidly to the ductwork. Where connected by flexible ducts, special flexible duct supports shall be provided, either from the ceiling suspension system or by independent suspension wires or rods from the building structure.

C. Louvers
   1. Exterior louvers shall be provided and installed by the HVAC Contractor in cooperation with the General Contractor.
   2. Install louver assemblies in strict accordance with manufacturer's recommendations. Louvers to be installed plumb, square, level and true.
   3. Seal perimeter of louver with exterior grade caulk to match louver color.

D. Painting – Paint interior visible surface of ductwork and plenums behind grilles, registers, diffusers and louvers flat black, as needed, to eliminate the sight of shiny surfaces.

END OF SECTION 23 3713

SECTION 23 7413 – PACKAGED, OUTDOOR, AIR HANDLING UNIT (RTU-1 & RTU-2)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Gas furnace.
3. ECM Fans
4. Roof curbs.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

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.

C. Operation and maintenance data.

D. Warranty.

1.3 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies.
2. Comply with ARI 270 for testing and rating sound performance.
3. Comply with ARI 1060 for testing and rating of energy recovery module.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigerant system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

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. Motors 1 HP and larger shall be “premium efficiency” series motor.

1.4 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer’s standard, but not less than five (5) years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer’s standard, but not less than ten (10) years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer’s standard, but not less than three (3) 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. Trane Inc.
2. York
3. Daikin

2.2 CASING

A. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs. Panels shall be easily removable for servicing all components.

A. Unit casing construction shall be double wall, 2” thick with minimum R-13 foam insulation.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

A. Air circulating fans shall be either ECM or direct drive plenum type with backwards curved fan blades. Direct drive plenum fans shall be provided with a VFD capable of full fan modulation.

B. Condenser fans shall be either ECM or direct driven propeller type with wire guards.

C. Barometric air relief shall be incorporated in the units.

2.4 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.

B. Supply -Air Hot Gas Refrigerant Reheat Coil

1. Aluminum plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.

C. Outdoor-Air Refrigerant Coil:

1. Aluminum -plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

1. All compressors shall be inverter duty, or digital scroll.

B. Refrigeration Specialties:

1. Refrigerant: R-32 / R-454b.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.

7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.

C. Refrigerant Detection & Mitigation Control

1. Refrigerant systems with an A2L or higher flammability classification, as defined in ASHRAE Standard 15 and 34, shall be equipped with a refrigerant leak detection system. The leak detection system shall provide the following mitigation controls to ensure there is never a build up of refrigerant greater than the lower flammability of the respective refrigerant. The following shall occur
   a. Activate refrigerant system safety shut-off valves to reduce releasable refrigerant charge.
   b. Energize the air circulation fan(s).
   c. De-energize potential ignition sources, including open flames (direct and indirect gas furnaces) and unclassified electrical sources of ignition with apparent power rating greater than 1kVa, where the apparent power is the product of the circuit voltage and current rating.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: 2” thick disposable MERV 8

2. 4” thick disposable MERV 14

2.7 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.

E. Safety Controls:

1. Gas Control Valve: Modulating.
2. 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.

2.8 ENERGY RECOVERY MODULE

A. Where indicated the rooftop unit shall have a factory mounted total enthalpy wheel rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.

B. All components shall be contained within a minimum 20 gauge galvanized steel cabinet finished with a powercoat oven baked enamel. The interior of casing shall be lined with 1" rigid foil faced insulation. Double wall construction shall be provided with a 20 gauge galvanized steel inner wall. Internal cabinet components shall be formed galvanized steel and shall provide structural support to side and top panels. All components shall be accessed through removable supply and exhaust access panels.

C. Rotor: Aluminum segmented wheel strengthened with radial spokes silica-gel desiccant coating.

D. Rotor: Polymer segmented wheel strengthened with radial spokes impregnated with nonmigrating, water-selective, molecular-sieve desiccant coating.

E. Drive: Fractional horsepower motor and gear reducer with speed changed by variable frequency controller and self-adjusting multilink belt around outside of rotor.

2.9 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.10 CONTROLS

A. Factory mounted digital controller capable of programming for cooling, heating, dehumidification, single zone variable air volume flow and economizer.

1. Provide BACNet MSTP control card.

2.11 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

C. Coil guards of painted, galvanized-steel wire.

2.12 ROOF CURBS

A. Roof curb for each unit shall be furnished with the unit, 14" tall.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mechanical equipment and supports that are exposed to wind shall be designed and installed to resist the wind pressure determined in accordance with the building codes. Refer to specification 23 0530 for additional requirements.

B. Provide condensate drainage piping from the drain pan with a 4” deep trap and cleanout.

C. The Electrical Contractor will provide power wiring thru a fused disconnect switch to one set of power terminals in each unit. All other power and control wiring required for the completion of the systems shall be furnished and installed by the HVAC Contractor. All wiring shall be furnished and installed by the HVAC Contractor. All wiring shall be run in ½” and larger conduit in accordance with applicable provisions of the Electrical Specifications.

END OF SECTION 23 7415

SECTION 23 8126 – VARIABLE REFRIGERANT VOLUME SYSTEM (ALT. G-1)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes split-system variable capacity heat pump / air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. System shall be variable refrigerant volumes series heat and cool model.

B. Operation of the system shall permit either individual cooling or heating of each fan coil simultaneously or all of all the fan coil units associated with one branch cool/heat selector box. Each fan coil or group of fan coils shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, and System Graphical User Interface.

1.2 SUBMITTALS

A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Operation and maintenance data.

1.3 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

A. The units shall have a manufacturer’s warranty for a period of 12 months from date of startup or 18 months from date of shipment, whichever comes first. The units shall have a limited labor warranty for a period of 12 months from date of startup or 18 months from date of shipment, whichever comes first. The compressors shall have a warranty of six (6) years from date of startup or six and ½ years from date of shipment, whichever comes first. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of equipment manufacturer according to manufacturer’s terms and conditions. All warranty service work shall be performed by a factory trained service professional.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Daikin – “VRV Emerion”
2. Trane/Mitsubishi - “Hyper Heat”
3. LG – “Multi V”

2.2 EVAPORATOR-FAN UNIT

A. General Components:

1. Refrigerant Coil:
   a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
   b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
   c. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
   d. The refrigerant connections shall be flare connections and the condensate will be 1-1/4” outside diameter PVC.
   e. A condensate pan shall be located under the coil.
   f. A condensate pump with a 18-3/8” lift shall be located below the coil in the condensate pan with a built in safety alarm.
   g. A thermistor will be located on the liquid and gas line.

2. Evaporator Fan:
   a. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
   b. The unit shall be equipment with an automatically adjusting external static pressure logic selectable during commissioning.
   c. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
   d. The airflow rate shall be available in three settings.
   e. The fan motor shall be thermally protected.
   f. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
   g. Fan motor external static pressure range for nominal airflow:

3. Filters:
   a. Wall Mounted & Ceiling Cassette’s
      1) Filters shall be reusable type, integral with the unit.
   b. Multi-Position Air Handling Units
      1) Unit shall have a 1” filter slot. Provide a MERV 8 filter with unit.

B. Ceiling Cassette

1. Indoor unit shall be a ceiling mounted fan coil unit, operable with specified refrigerant, equipped with an electronic expansion valve. Includes wall mounting bracket. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The indoor unit's sound pressure shall range from 31 dB(A) to 41 dB(A) at low speed measured at 3.3 feet below and from the unit.

2. The unit shall be ceiling mounted in the lay-in grid.

3. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

4. The unit shall be provided with either a built-in or factory supplied condensate pump.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER UNIT

A. General:

1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator. High/low pressure gas line, liquid and suction lines must be individually insulated by the installing contractor between the outdoor and indoor units.
2. The outdoor unit can be wired and piped with outdoor unit access from the left, right, rear or bottom.
3. For future expansion each outdoor system shall be able to support the connection of up to 41 indoor units dependant on the model of the outdoor unit.
4. The system will automatically restart operation after a power failure and will not cause any settings to be lost.
5. The unit shall incorporate an auto-charging feature and a refrigerant charge check function.
6. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
7. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
8. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.
9. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.

10. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
11. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Casing steel, finished with baked enamel, 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.

C. Compressor:

1. The inverter scroll compressors shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type” with a maximum speed of 7,980 rpm.
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be 6% to 100%.
5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration.
9. Units sized 20 nominal ton shall contain a minimum of 4 compressors. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

D. Refrigerant Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti- corrosion acrylic resin and hydrophilic film type E1.

5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns

E. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
3. The fan shall be a vertical discharge configuration.
4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
6. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.

2.4 CONTROLS

A. Each fan coil unit shall be provided with a room mounted zone controller that includes an integral room temperature sensor. The sensor shall have an LCD display and room temperature setpoint capability.

B. Control wiring between room sensor, fan coil unit, branch selector unit and outdoor unit shall be 16VDC non-shielded, stranded 2 conductor cable.

C. A graphical user interface control panel will be used to allow building operator to monitor all system fan coils and outdoor heat recovery unit. The user interface will include an LCD screen with graphical representation of each fan coil and outdoor unit. The Graphical User Interface will allow the building operator to view individual fan coil and outdoor unit diagnostics and set points. The Graphical User Interface will allow the building operator to set the operating schedule of the equipment through the scheduling function.

2.5 REFRIGERANT

A. Unit shall utilize one of the following refrigerants:
1. R-32
2. R-454B

2.6 DEFROST CYCLES

A. The condensing unit shall have the option of a continuous heating defrost cycle.

2.7 ACCESSORIES

A. Provide a 12” tall condensing unit stand from the unit manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mechanical equipment and supports that are exposed to wind shall be designed and installed to resist the wind pressure determined in accordance with the building codes. Refer to specification 23 0530 for additional requirements.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounted, compressor-condenser components on concrete pad. If the manufacturer requires condensing units to be mounted on a stand for condensate runoff, the manufacturer shall provide the appropriate stand.

D. Provide vibration isolation for Ceiling Suspended Fan Coil Units.

E. Provide mounting stand for vertical Multi-Position Air Handling Unit type fan coil units.

F. Provide additional refrigerant charge as required for system to function properly.

G. Provide all required control wiring and power to control components.

H. Install and program wireless communication device and assist owner with set-up of phone application.

3.2 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.

B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

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 components, and retest.

D. Startup and configuration of the Graphical User Interface shall be provided by the unit manufacturer. Training on use of the control system is to be part of 1 day owner training provided by the unit manufacturer

END OF SECTION 23 8126

SECTION 26 0001 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Electric Services
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Equipment Selection
16. Shop Drawings
17. Testing
18. Final Inspection and Punch List
19. Operation and Maintenance Manuals
20. Record Drawings
21. Warranties
22. Project Closeout
23. Operation and Adjustment of Equipment
24. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Electrical work.

C. A complete and functional Electrical system installation shall be provided under this Division. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

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.

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.

1.4 SCOPE OF WORK

A. The scope of the electrical work includes furnishing, installing, testing and warranty of all electrical work and complete electrical systems shown on the electrical drawings and specified herein, including Division 00, Division 01, Division 26 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word "provide", as used shall mean "furnish and install". If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having equipment, wireways and fittings fabricated and delivered in advance of making actual measurements shall not be sufficient cause

to avoid making offsets and minor changes as may be necessary to install wireways, fittings and equipment.

D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

E. Equipment, ductwork and piping shall not be installed in the dedicated electrical space above or in the working space required around electrical switchgear, motor control centers or panelboards as identified by NEC 110.26 Spaces About Electrical Equipment – 1000 Volts Nominal or Less. For Equipment rated over 1000 volts nominal – 110.32 Work Space About Equipment – 110.33 Entrance and Access to Work Space – 110.34 Work Space and Guarding. The Electrical Contractor shall caution other trades to comply with this stipulation.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the Contractor causing such conflict. The Architect's decision shall be final in regard to arrangement of equipment, conduit(s), devices, wireways etc., where conflict arises.

G. Provide offsets in system runs, additional fittings, necessary conduit, pull boxes, conductors, switches and devices required to complete the installation, or for the proper operation of the system. Each contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved from the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ASTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Refer to Section 017300 Execution.

B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any

issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. Except where the permit application is made by the Architect or the Engineer, the Electrical contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the Electrical work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities except fire alarm permit documents shall be prepared and submitted by an approved, licensed fire alarm subcontractor.

C. Include payment of all permit and inspection fees applicable to the work in this Division.

D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 TEMPORARY ELECTRIC SERVICES

A. Refer to Section 015000 – Temporary Facilities and Controls for division of responsibilities for temporary utilities.

B. The temporary service and temporary lighting for construction is provided by the Electrical Contractor.

C. The Electrical Contractor is cautioned to carefully consider the possible sources of temporary electric service and the probable location of the General Contractor's office.

D. The Electric Contractor shall furnish, install and pay for all necessary conduit, wire, metering, poles, switches, receptacles, lights and accessories to provide a 200 amp, 120/240 volt, 1 phase, 3 wire temporary electric service with the main disconnect switch and a 42 circuit load center at a location specified by the General Contractor.

E. Labor, receptacles, boxes, fixtures, wire, etc. required by the various Contractors inside their offices shall be paid for by the respective Contractors.

F. Lighting fixtures shall be placed every 40 ft. along each corridor or where corridors do not occur, along the long axis of all rooms. Provide a minimum 800 lumen lamp in a commercial grade molded plastic socket and lattice wire guard temporary lighting assembly with extra heavy duty “ST” 3-wire cord. Lamps shall be spaced a minimum of 10 ft. apart. For large open areas or during the early stages of construction, high lumen (4,000 minimum) LED “Corn Cob” lamps may be utilized. Receptacle circuits shall consist of 1-gang cast "FS" type box with grounded duplex receptacles a maximum of 50 ft. on center with a maximum of 4 per circuit. All receptacle circuits shall be protected by its own overcurrent device in a panel board. Install wiring and equipment above 6'-6" and below the finished ceiling. Extend circuits as required. Provide GFCI protected receptacles and circuits as required by NEC and OSHA.

G. Contractors requiring extension cords shall provide their own cords and plugs up to capacity of 20 amperes. For services to larger items of equipment and welders, this Contractor shall extend proper feeders as requested at the expense of the Contractors requiring the service.

H. The Electrical Contractor shall maintain the temporary light and power system for the duration of the work and shall remove it from the site when directed. Temporary wiring and equipment shall remain the property of the Electrical Contractor.

I. The use of the permanent electrical system for temporary services during the latter stages of construction shall be allowed. Expedite completion of system as practicable to this end. Maintain the system during this period.

J. Warranty periods on equipment, materials and systems shall commence upon Owner acceptance of the building or systems. Temporary use shall not jeopardize or alter warranty requirements.

K. The complete temporary service shall comply with OSHA, and all Code requirements.

1.12 WORKMANSHIP

A. Refer to Section 01400 Quality Requirements.

B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

C. Electrical work shall be performed by a licensed Electrical Contractor in accordance with requirements of the jurisdiction.

1.13 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in the Electrical Contract:

1. All metal which is not factory or shop painted and which remains exposed to view in the building including finished areas, mechanical rooms, storage rooms and other unfinished areas shall be given a prime coat of paint.
2. All metal installed outside the building which is not factory or shop painted shall be given a prime coat of paint.
3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.
4. Apply Z.R.C. Cold Galvanizing Compound, or approved equal, for touch-up of previously galvanized surfaces.
5. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.

B. Finish painting is included in the General Contract. Refer to the Cutting and Patching paragraph in this Section for finishing requirements.

1.15 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

D. Before placing each system in operation, the equipment shall be thoroughly cleaned; cleaning shall be in accordance with equipment manufacturer's recommendations.

E. Refer to appropriate Sections for cleaning of other equipment and systems for normal operation.

1.16 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. All electrical equipment and wiring shall bear the Underwriters Laboratories, Inc. label where UL label items are available, and shall comply with NEC (NFPA-70) and NFPA requirements.

C. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specification, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturers listed.
2. Where the words "or approved equal" appear after a manufacturer's name, specific written approval must be obtained from the Engineer during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.
3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval during shop drawing submittal.

D. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

E. Before bidding equipment, and again in the preparation of shop drawings, the Contractor and his supplier shall verify that adequate space is available for entry and installation or the item of equipment, including associated accessories. Also verify that adequate space is available for servicing of the equipment and that required NEC (and other applicable Code’s) clearances are met. The Contractor and his supplier shall also verify compatibility of equipment specified with available system/service voltages, etc.

F. If extensive changes in conduit, equipment layout or electrical wiring and equipment are brought about by the use of equipment or existing site conditions which are not compatible with

the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.17 SHOP DRAWINGS

A. Refer to Section 016000 Product Requirements.

B. One set of shop drawings, in electronic format (pdf), with descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in Division 01. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.

C. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

D. The review of shop drawings by the Architect or Engineer shall not relieve the Electrical Contractor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.

E. Shop drawings of the following electrical equipment and materials shall be submitted:

1. Firestopping.
2. Wireway.
3. Miscellaneous cabinets.
4. Plenum cable.
5. Wiring devices and coverplates.
6. Dry type transformer – secondary.
7. Panelboards and associated distribution equipment.
8. Fuses.
9. Motor controllers and disconnects.
10. Lighting Controls including layout plans of Occupancy Sensors.
11. Low voltage switching/lighting control system
12. Lighting fixtures and lamps.
13. Fire alarm system with schematic and point to point wiring diagrams.

1.18 TESTING

A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.

B. As each electrically operated system is energized, it shall be tested for function.

C. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Architect or Engineer.

D. All signaling and communications systems shall be inspected and tested by a qualified representative of the manufacturer or equipment vendor. Submit four (4) copies of reports indicating results.

E. Tests shall be witnessed by field representatives of the Architect or Engineer or shall be monitored by a recorder when appropriate. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests.

F. Instruments required for tests shall be furnished by the Contractor.

1.19 FINAL INSPECTION AND PUNCH LIST

A. Refer to Section 017700 Closeout Procedures.

B. As the time of work completion approached, the Contractor shall survey and inspect his work and develop his own punch list to confirm it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.

C. Requests to the Architect, Engineer or Owner for final inspection may be accompanied by a limited list of known deficiencies in completion, with appropriate explanation and schedule for completing these; this is in the interest of expediting acceptance for beneficial occupancy.

D. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completion or verification. Corrective action shall be taken by the Contractor to the satisfaction of Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.20 OPERATING AND MAINTENANCE MANUALS

A. Refer to Section 017823 Operation and Maintenance Data.

B. Digital copy (pdf) of operating and maintenance manuals shall be assembled for the Electrical work by the Contractor and provided on a flash drive.

C. All shop drawings and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of replacement material required. Major items of equipment shall consist of not less than the following:
   1. Fire Alarm System.
   2. Specialty equipment.

D. Standard NEMA publications on the operation and care of equipment may be furnished in lieu of manufacturer's data where the manufacturer's instruction is not available.

E. These shall be combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.21 RECORD DRAWINGS

A. Refer to Section 017839 Project Record Drawings.

B. The Electrical Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Architect. This shall apply particularly to underground and concealed work, and to other systems where the installation varies to a degree which would justify recording the change.

1.22 WARRANTIES

A. Refer to Section 017700 Closeout Procedures.

B. This Contractor shall warrant all workmanship, equipment and material entering into this contract for a period of one (1) year minimum from date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

C. This provision is intended specifically to cover deficiencies in contract completion or performance which are not immediately discovered after systems and placed in operation. These items include, but are not limited to, motor controller malfunction, heater element changes required for motor controller, fuse replacement where fuses blow due to abnormal shorts, adjustments and/or replacement of malfunctioning equipment and adjusting special equipment and communication systems to obtain optimum performance.

D. This provision shall not be construed to include maintenance items such as making normally anticipated adjustments or correcting adjustment errors on the part of the Owner's personnel.

E. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

F. Extended warranties shall be provided where indicated in the equipment specification Sections.

1.23 PROJECT CLOSE-OUT

A. Refer to Section 017700 Closeout Procedures

B. The following schedule summarizes actions to be taken or submittals to be completed by Contractor prior to issuance of the Contract Completion Certificates. Refer to Division 1 – General Requirements and applicable paragraphs of this Section and the applicable trade Divisions for additional requirements. This information should be submitted at least thirty days in advance of request for final inspection. Where possible, the information shall be bound in 8.5” x 11.0” hard back binders.

1. Materials/Suppliers List
2. Record Drawings
3. Certificate of Inspection
4. Electrical Tests and Adjustments
5. Operating Instructions and Maintenance Manuals
6. Identification Nameplates
7. Manufacturer’s Certification of Installation:
    a. Fire Alarm System
8. Receipt for Spare Fuses
9. Fuse Identification
10. Receipt for Keys:
    a. Panelboards
11. Complete Punch List
12. Waiver of Liens
13. Affidavit of Wage Compliance
14. Change Orders and Allowance Adjustment

1.24 OPERATION AND ADJUSTMENT OF EQUIPMENT

A. As each system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing and adjusting voltages and currents and adjusting all operating equipment.

B. Caution: Verify that all bearings of equipment furnished are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the other trades judgment in these matters. Follow specific instructions in regard to lubrication of equipment furnished under this Contract.

1.25 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. Refer to Section 017900 Demonstration and Training as well as individual Division 26 Sections for requirements.

B. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.

C. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.

D. A minimum of 4 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:

1. Show locations of items of equipment and their purpose.
2. Review binder containing instructions and equipment and systems data.
3. Coordinate written and verbal instructions so that personnel understand each.
4. Separate instructions shall be given by manufacturer's representatives for the various special and communications systems.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 26 0001

SECTION 26 0002 – ELECTRICAL WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. Inspection of Existing Building
2. Work Hours
3. Tobacco Products
4. Barriers and Signage
5. Storage of Tools and Materials
6. Protection of Existing Building and Equipment
7. Confined Spaces
8. Noise, Fumes and Dust Control
9. Continuity of Systems
10. Cutting and Patching
11. Cleaning

1.2 INSPECTION OF EXISTING BUILDING

A. Each bidder shall inspect the project site and the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report to the Architect any significant discrepancies which may be discovered in a timely fashion so that direction may be provided in an addendum. After the contract is signed, no allowance will be made for failure to have made a thorough inspection.

1.3 WORK HOURS

A. Work hours for construction shall be as defined in Section 01150- Project Phasing or other specification sections or drawing notes.

B. Where allowed, contractors may work normal hours except after hours is required for operations that are noisy, generate obnoxious fumes or dust, require shut down of ventilation systems, etc. The Owner reserves the right to stop normal hour work where the Owner deems the effort to be disruptive to their ongoing operations.

C. Any work that creates hazards in or requires closure of corridors, exit pathways or stairwells work in corridors must be performed after hours when the building is not occupied.

D. All occupied areas, corridors exit pathways and stairwells must be left clean, lighted (including emergency egress and exit signage) usable and safe at the end of each work shift.

E. Access to the work area shall be coordinated with the Owner; follow all security protocols for parking, sign in, key control, etc. established by the Owner.

1.4 TOBACCO PRODUCTS

A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.

B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

A. Store all site material and tools in the active job site area, specific storage areas are not provided except where otherwise noted for material and tools. The contractor is responsible for security.

B. Storage is specifically prohibited in means of egress paths and stairwells.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

A. The Owners' property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen or other suitable barriers where dust and debris is generated. Tape ends of barriers for sealing purposes.

B. Provide 55 gallon drums or smaller buckets as appropriate and use funnels where draining liquid systems.

C. Provide plywood sheets for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.

3.4 CONFINED SPACES

A. Notify the Owner when performing work in confined spaces. Provide a written procedure for approval and obtain approval from the Owner when so requested.

B. All work in confined spaces shall be done in accordance with OSHA regulations.

3.5 NOISE FUME AND DUST CONTROL

A. Provide barriers and ventilation as required to limit the effect from construction generated noise fume and dust control on spaces that continue to be occupied by the Owner. Refer to protection of building and equipment paragraph above. In addition to the basic protection, provide additional visqueen barriers to limit airborne migration of dust and fumes. Provide supplemental portable fans to exhaust air to the outside of the building where appropriate. Use of the Owners' ventilation systems to induce positive or negative pressure is prohibited unless authorized by the Owner. Shut off ventilation systems serving the area where use of these systems can induce fumes or dust into return or exhaust ducts. Where systems need to remain operational for occupied areas, arrange to temporarily shutoff portions of the system in the work area. Coordinate all efforts requiring modification or shutdown of ventilation systems with the Owner. Contractor shut down of these systems is prohibited without Owner permission.

B. Arrange with the Owner when required to shutoff fire alarm or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to generated dust or fumes. Minimize outages and coordinate efforts to limit the effect due to false alarms.

C. Where significant dust or fume generating work, welding or cutting operations are required for removal or new work, provide fume removal equipment with telescoping arms to locally capture the fumes. Fume exhaust shall be directed outside or adequately filtered and recirculated.

D. Areas shall be thoroughly ventilated after completion of the work on a daily basis to remove residual odors and fumes before occupancy occurs the next day.

E. Provide vacuum cleaners and other equipment to clean and restore conditions.

3.6 CONTINUITY OF SYSTEMS

A. Work shall be so planned and executed as to provide reasonably continuous services of existing systems throughout the construction period. Where necessary to disrupt services for short periods of time for connection, alteration or switch-over, the Owner shall be notified in advance and outages scheduled at the Owner's reasonable convenience.

B. Submit, on request, a written step-by-step sequence of operations proposed to accomplish the work, The outline must include tentative dates, times of day for disruption, downtime and restoration services. Submit the outline sufficiently in advance of the proposed work to allow

the Architect to review the information with the Owner. Upon approval, final planning and the work shall be done in close coordination with the Owner.

C. Shutdown of system and work undertaken during shutdowns shall be bid as being done outside of normal working hours on a premium time basis. The Owner shall be consulted to schedule shutdowns at times acceptable to the Oener.

3.7 CUTTING AND PATCHING

A. Where conduits are to pass thru, above or behind existing walls, partitions, floors, roof or ceiling, cutting, patching and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.

B. All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval of the Architect. Wall, floor and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.

3.8 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

END OF SECTION 26 0002

SECTION 26 0003 – SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

1.1 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".

H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

I. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

J. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

K. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

1.2 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve

seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

1.3 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 26 0000

SECTION 26 0004 – FIRESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer’s instructions.

B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.

C. Provide firestop system for every conduit or opening at penetration of all fire resistance rated walls and horizontal assemblies.

D. Provide rigid supports for conduit on both sides of the fire resistance rated wall or assembly where required as part of the fire stop assembly.

E. Coordinate opening size and additional framing requirement with the General Contractor for each opening to meet the firestop installation requirements.

F. Refer to 26 0533 Raceway and Boxes for Electrical Systems for sleeve requirements and treatment of penetrations not requiring firestopping.

G. Annular space of penetrations of nonfire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a nonfire-resistant rated roof/ceiling assembly shall be filled with an approved firestopping material to resist the free passage of flame and products of combustion.

H. Smoke Barriers:
1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

I. Smoke Partitions:
1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke. Non-rated smoke partitions do not require a fire stopping system.

3.2 BUILDING STRUCTURE FIRE STOPPING

A. Where building structural members have a fire stopping system installed and portions of this fire stopping system are removed to install new systems hangers, the E.C. shall provide new fire stopping system onto portions of the building structure and hanger where fire stopping was removed. The fire stopping system shall be equal to the existing system and be 2-hour rated.

END OF SECTION 26 0004

SECTION 26 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for all in-grade underfloor conduit, exterior ducts, conductors, conduit, pullboxes, utility trenches and any incidental work included in the Electrical Contract.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over conduit or duct in a trench, including haunches to support sides of conduit.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated sub-grade in a trench before laying manhole, pullbox or conduit.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

A. Excavate for all in-grade underfloor conduit, exterior ducts, conductors, conduit, pullboxes, utility trenches and any incidental work included in the Electrical Contract.. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 26 002 Basic Electrical Materials and Methods. All work shall comply with requirements set forth in Division 2.

B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.

C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.

D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.

E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

2.1 Refer to Division 31 Earthwork for bedding and backfill materials

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

A. Interior and exterior trenches shall be over-excavated and the conduits, ducts or conductors shall be laid on 6" minimum depth sand bed.

B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or crushed limestone,

3/4" maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18" above the top of the conduit or conductor. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.

C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.

D. Backfill shall be mechanically compacted in layers not over 6" deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.

E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.

F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.

G. All exterior underground direct buried conductor, conduit and concrete encased ducts shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6" wide with black letters identifying the type of service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18' above and on the centerline of the conductor, conduit or duct.

END OF SECTION 26 0005

SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 VAC and less.
2. Connectors, splices, and terminations rated 600 VAC and less.
3. Photovoltaic wires and cables rated for 1500 VDC or less.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC and metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR SIZE

A. Refer to schedule on drawings.

3.2 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Stranded for No. 12 AWG and larger.

3.3 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

C. Class 1 Control Circuits: Type THHN-THWN, in raceway.

D. Class 2 Control Circuits: Power-limited cable, in raceway.

E. Use conductors such as type FEP with high temperature insulation as identified in the NEC for connections to resistance heating elements or in other areas subject to temperature exceeding the rating of THWN, XHHW or THHN.

F. In addition to the conduit system, a separate grounding conductor shall be installed with all feeders and branch circuitry.

G. Equipment grounding conductors shall be green, or completely taped green, at all accessible points.

H. Wire size ampacity shall equal or exceed its overload protective device. Where sizes shown on the drawings are greater than the apparent ampacity requirements, the size shown shall prevail to compensate for voltage drop. In no instance shall conductors be installed that are less than required by the N.E.C. Minimum conductor size shall be No. 12 AWG except No. 14 AWG may be used for control wiring or where otherwise specifically indicated.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Conduit systems shall be clean and clear before pulling wires. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Pulling of branch circuit conductors shall be performed by manual means without the use of levers or heavy pulling devices that may compromise the conductor’s or insulation integrity.

D. A maximum of 8 conductors shall be installed in a branch circuit conduit unless specifically noted otherwise on the drawings. Equipment ground conductors are not counted when determining maximum fill.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Wiring in vertical raceways shall be supported with strain relief devices; Kellems grips or approved equal.

G. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

H. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

I. 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.

J. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

K. Underground splices (including splices in exterior pullboxes and manholes) shall be made using sealing kits or wire nuts U.L. listed and approved for the application.

L. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack. Refer to additional notes on plans for branch circuitry installation requirements.

3.5 TESTING

A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.

B. As each electrically operated system is energized, it shall be tested for function.

C. On all electric services including change-outs, backfeeds, etc. the Contractor shall verify phase rotation and voltage readings to assure the final installation is proper. Submit to the Engineer in writing a record of voltage readings and current readings taken at no-load and fully loaded conditions.

D. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Engineer.

E. Tests shall be witnessed by field representatives of the Engineer or shall be monitored by a recorder. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests. Copies of all test reports shall be included in the O&M manuals.

F. Instruments required for tests shall be furnished by the Contractor.

END OF SECTION 26 0519

SECTION 26 0523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. UTP cabling.
2. RS-232 cabling.
3. RS-485 cabling.
4. Low-voltage control cabling.
5. Control-circuit conductors.
6. Identification products.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

B. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

C. Maintenance data.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of an NRTL.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: **25** or less.
2. Smoke-Developed Index: **50** or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

B. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of **Category 6** cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." **Flexible metal conduit shall not be used.**

1. Outlet boxes shall be no smaller than 2 inches wide, 4 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Description: Plywood, **fire-retardant treated,** 3/4 by 48 by 96 inches. Prime and finish paint to match adjacent walls (if finish painted) or finish paint white or light gray.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M.
12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, four-pair UTP.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, **Category 5e**.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    b. Communications, Riser Rated: Type CMR, complying with UL 1666.
    c. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    d. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

2.5 RS-232 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.6 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.

3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.7 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.8 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, **Type THHN-THWN**, in raceway, complying with **UL 83**.

B. Class 2 Control Circuits: Stranded copper, **Type THHN-THWN, in raceway** or **power-limited cable, concealed in building finishes**, complying with **UL 83**.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.9 IDENTIFICATION PRODUCTS

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. Brady Corporation.
2. HellermannTyton.

3. Kroy LLC.
4. Panduit Corp.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than **60 inches** apart.

3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

3.3 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, **No 14** AWG.
2. Class 2 low-energy, remote-control, and signal circuits, **No. 16** AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, **No 12** AWG.

3.4 FIRESTOPPING

A. Comply with requirements in Section 26 0004 "Firestopping for Electrical Systems."

3.5 GROUNDING

A. For data communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 0523

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 GROUNDING RODS

A. Grounding Rods shall be copper clad, molten welded copper to steel; unless otherwise designated, ¾” diameter X 10 ft. long.

2.3 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Clamps and continuity devices shall be non-ferrous material, UL approved. Connections to ground rods and all underground connections shall be made with welded connections (“Thermoweld” or “Cadweld”).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels.

B. Wiring devices shall be connected with grounding jumper from ground pole on device to grounding screw (or grounding pigtail) in the outlet box.

C. Paragraph below may supplement equipment grounding conductor and may be in excess of NFPA 70 requirements. Retain if necessary or desired and coordinate with Drawings.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

C. Main service neutral shall be grounded to the street side of the building water service. A bonding jumper shall be installed around the water meter. In addition to using the water service as a grounding electrode, effectively grounded building steel, driven ground rods outside or buried electrode shall be provided and connected. Bond to interior metallic water, gas and all other metallic lines.

D. The complete metal conduit system shall be used for the equipment grounding system. Conduit systems and associated fittings and terminations shall be made mechanically tight to provide a continuous electrical path to ground and shall be safely grounded at all equipment by bonding all metallic conduit to the equipment enclosures with locknuts cutting thru paint of enclosures. Bond all conduits entering service entrance switchboard with a ground wire connecting the grounding bushings to the equipment ground bar. Conductors shall be sized per NEC Tables 250-66 and 250-122. Bond all communications conduit systems to ground.

E. In addition to using the conduit system for grounding, a complete auxiliary green wire equipment grounding system shall be installed, continuous from main ground, thru distribution and branch circuit panelboards and paralleling all feeders and branch circuit wiring. Grounding conductor sizes shall comply with NEC Table 250-122, minimum size shall be #12 copper except #14 on control circuits. This shall apply to all circuits rated 100 volts or more above ground potential.

F. Ground neutral of all transformers for separately derived systems.

G. Motor frames shall be bonded to the equipment grounding system by an independent green wire, sized as shown.

H. Cord connected appliance frames shall be grounded to the equipment grounding system thru a green wire in the cord.

I. A green grounding conductor shall be installed in all circuit conduits, including exterior underground conduits.

J. System neutral connections shall be insulated from metal enclosures except at the neutral of the service entrance equipment and on the neutral of a separately derived system. Connections to the main service enclosure shall be by means of bonding jumpers.

K. The building neutral shall be identified throughout with white conductors for 280/120 volt systems and grey conductors for 480/277 volt systems. Where there are neutral conductors from a separately derived system (such as 120/208 volt, 3 phase, 4 wire where the main building service is 277/480 volt, 3 phase, 4 wire) the neutrals of the two systems shall be separately identifiable per NEC Article 200.

L. A minimum #6 ground wire shall be run from each telephone backboard/data rack back to the main building ground. Or where indicated on the drawings or in the specifications, a separate communications grounding system shall be provided and bonded to the electrical grounding system at the main ground bar.

M. Where metal covers on pull boxes and junction boxes are used, they shall comply with the grounding and bonding requirements of NEC Article 250.

N. Connections to driven ground rods or other such electrodes shall be a minimum of 3 feet from the building foundation wall or beyond the roof drip line, whichever is greater.

O. The ground rods of the electrical grounding system shall not be used as the electrodes (ground rods) of the lightning protection system (where specified) and vice versa. However, the lightning protection system (where specified) shall be bonded to the electrical grounding system at one point per NEC.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. Thomas & Betts Corporation.
e. Unistrut; Tyco International, Ltd.
f. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Utilize supports with swivel type attachments to maintain true vertical support from sloped structure or inclined structural elements (such as beam clamp with swivel option).

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on blocking attached to substrate by means that meet anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

A. Touchup: 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.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.4 CONCRETE BASES

A. Provide dowel rods to connect concrete bases to concrete floors/slabs/substrates. Unless otherwise indicated, install dowel rods on maximum 18-inch centers around the full perimeter of concrete base.

B. Provide epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor/slab/substrate, unless concrete bases are installed directly on grade. Place and secure anchorage devices. Using setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast galvanized or stainless-steel anchor-bolt inserts into bases.

D. Indoor bases shall be at least 4” thick and shall have straight and finished sides and a 1”-45 degree chamfer at the top perimeter. Reinforcing steel bars shall be placed in both directions of the bases. Where required for supplemental support, provide lateral support work to adjacent wall(s). Provide concrete bases/housekeeping pads beneath all electrical power and systems distribution equipment that is floor mounted or wall mounted within 4” of the floor.

E. Outdoor bases shall be at least 6” thick and shall have straight and finished sides and a 1”-45 degree chamfer at the top perimeter. Perimeter of pads shall extend down below the frostline. Reinforcing steel bars shall be placed in both directions of the bases and a mesh overlay shall be provided. Where required for supplemental support, provide lateral support work to adjacent wall(s). Provide concrete bases/housekeeping pads beneath all electrical power and systems distribution equipment that is slab or grade mounted or mounted within 6” of slab or grade.

F. Unless indicated otherwise in specifications or on drawings, use minimum 3000-psi, 28-day compressive-strength concrete. Size and provide concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

G. Forms: As required for equipment pads or other special applications in field, provide forms made of 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 distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends. Do not remove forms for 24 hours after concrete has been placed. Set forms to required grades and lines, rigidly braced and secured. Provide 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. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage. Form areas that involve termination of spare conduits below grade, or that involve continuation of conduits by others, accordingly to accommodate easy future access to the ends of conduits for future extensions.

H. Reinforcement: Cut bars true to length with ends square and free of burrs. Provide metal expansion caps for one end of each dowel bar in expansion joints. Design caps with one end closed and minimum length of 3” to allow bars movement of not less than 1”, unless otherwise indicated. Provide these for joining applications where continuous pouring cannot be accomplished.

I. Concrete Placement: Remove loose material from subbase surface immediately before placing concrete. Check subbase and forms for line and grade before placing concrete. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Place concrete using methods that prevent segregation of mix. Use splash boards to divert the flow of concrete away from the trench sides, and to avoid dislodging soil and stones. Coordinate with Owner's Representative at least 72 hours prior to placing concrete. Line up concrete trucks as required to achieve one continuous pour where applicable. Do not backfill until a minimum of 48 hours have passed.

J. Concrete Finishing: Smooth surface by screeding after striking-off and consolidating concrete. Provide Class A finishing. Broom finish concrete pads, and aprons around pullboxes and structures. Protect concrete from damage until acceptance of work. Exclude traffic over affected areas for at least 14 days after placement.

3.5 PLYWOOD EQUIPMENT BOARDS

A. Plywood Equipment Boards: Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent. Provide plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than ¾ inches deep. Provide marine grade plywood where subject to moisture conditions. Provide Simpson Strong Tie (or equal) expansion screw anchors.

B. Unless otherwise noted, boards shall be painted with two coats of good grade weatherproof flat gray non-conductive fire-retardant paint on all sides and edges (prior to mounting) and plumbed in a true vertical position. Provide nominal ½" rustproof spacers between back of plywood and wall. Cut, fit, and place plywood equipment boards accurately in location, alignment, and elevations to support and anchor electrical materials and equipment. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members. Attach to substrates as required to support applied loads. Maintain at least 4 inches from bottom of plywood equipment boards and the finished floor surface.

C. Unless directed otherwise in field, plywood equipment boards shall be 8 feet high by ¾ inches deep by length shown on drawings (as dimensioned or as scaled) or length as required to accommodate equipment if not indicated on drawings. Unless directed otherwise in field, provide plywood equipment boards for all indoor surface mounted panelboards and systems "head-end" equipment for all applications where located in mechanical or electrical rooms/areas and only where specifically shown on drawings for all other applications.

END OF SECTION 26 0529

SECTION 26 0533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel only; set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 CABLE TRAY (Ladder Type with Two Side Rails and Rungs or Center Spine Type)

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Mono Systems.
3. MP Husky.
4. Thomas & Betts.
5. Cablofil.
6. Cope.

B. Description: Cable tray shall be NEMA Class 12B aluminum, 12” wide with 4” load depth, 9” rung spacing and supported at 12 ft. intervals at a minimum or as required by manufacturer to meet load rating and as field conditions and structure dictate.

C. General: Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated, with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

D. Materials and Finish: Aluminum; straight sections, fitting side rails, rungs and covers shall be extruded from Aluminum Association Alloy 6063.

E. All fittings must have a minimum radius of 12 inches.

F. Splice plates shall be the bolted type. The resistance of fixed splice connections between adjacent sections of tray shall not exceed .00033 ohms. Splice plate construction shall be such that a splice may be loaded anywhere within the support span without diminishing rated load capacity of the cable tray. Splice plates shall be furnished with straight sections and fittings or as recommended by the manufacturer.

G. Trapeze hangers shall be supported by 3/8” (minimum) diameter rods.

H. Provide means of bonding each joint for absolute grounding of the cable tray.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Brushed Aluminum with snap-on covers.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Mono Systems.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Hubbell Wiring Systems.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Mechanical rooms below 18: AFF.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT except MC cable may be utilized in walls where routed vertically. (Provide homeruns in EMT to the center of rooms and utilize MC for vertical drops to receptacles/devices. No horizontal MC runs in walls except where run to devices below windows). FMC may be utilized in existing walls.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. EMT: Use all steel, compression type or all steel setscrew type, concrete tight.

3. Flexible conduit: Use malleable iron, “squeeze” type, non-insulated. (For lighting fixture whips only: Use all steel or die-cast screw-in connector).

4. Liquid-tight conduit: steel or malleable iron.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter. Generally run conduit and conductors as high as practicable against underside of floor slab in concrete construction or immediately below the **top chord** of bar joist construction unless otherwise shown or noted. This high level zone shall be used for running electrical raceways and shall be grouped or racked together wherever feasible. Runs at bottom chord level or ceiling grid level are not acceptable.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation. Plan raceway routing to minimize the number of offsets and junction boxes.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated. All conduit shall parallel building lines.

G. Conduit shall be run overhead and shall not be run below concrete slabs unless specifically indicated on the drawings and in the legend on the drawings.

H. Conduit crossing building expansion joints shall have expansion provisions with grounding continuity, use special expansion fittings listed for the application. Refer to the Architectural and Structural floor plans and details for locations of expansion joints.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

K. Raceways for Data, Audio Visual and Communications Cable: Install as follows:

1. 1-Inch Trade Size and Smaller: Install raceways in maximum lengths of 75 feet.
2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

3. Raceway shall be installed continuously from outlet box to above edge of nearest cable tray above accessible ceiling.

4. Bond raceway to cable tray with approved grounding bushing, bonding jumper and necessary fittings.

L. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in all locations except MC may be used for lighting fixture whips.

M. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

N. Do not install wall-mounted boxes back-to-back in opposite sides of wall; in stud walls, boxes shall be on opposite side of studs.

O. Provide access to all junction and pull boxes.

P. Set metal floor boxes level and flush with finished floor surface. Provide trim ring compatible with finish floor system.

Q. Pull mandrel or large swab thru conduit to assure freedom from debris before pulling wires. Use listed pulling lubricants where necessary.

R. Provide four (4) 1 inch diameter spare conduits for each flush mounted branch circuit panelboard; extend from top of panelboard to above an accessible ceiling for future use.

S. Contractor shall record carefully on a set of "as-built" prints, the exact location of all feeder conduits (100 amps and larger).

T. Unless noted otherwise on the drawings, a maximum of 8 conductors shall be installed in a branch circuit conduit. This maximum is a count of all phase and neutral conductors only.

3.3 INSTALLATION OF EXPOSED CONDUIT OUTDOORS

A. Only install conduit exposed outdoors when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide colors to match respective surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

3.4 INSTALLATION OF EXPOSED CONDUIT ON ROOFS

1. Only install conduit exposed on rooftops when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed on rooftops, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide white paint of flat rooftops that have finishes white in color, and for otherwise-colored roof finishes that are not visible from the building interior or from the ground outdoors. Elsewhere select colors to match surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

END OF SECTION 26 0533

SECTION 26 0537 – J-HOOK PATHWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

A. Conduit/Raceway/Pathway: “Conduit”, “raceway”, “pathway” and similar terms shall be taken to mean “conduit” unless specifically indicated otherwise in project manual documents, or unless specifically directed otherwise in field by Owner or Design Professionals. All such terms shall be considered synonymous for the general purposes of installation means and methods.

B. Provide J-Hook pathway systems only for the following limited applications: Class 2 (“low voltage”) control wiring concealed above accessible finished-ceiling systems.

PART 2 - PRODUCTS

2.1 J-HOOK PATHWAYS

A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below, or equivalent NRTL listed and labeled equivalent.
   1. Cooper B-Line (basis of design, model numbers as specified further below).
   2. Mono-Systems, Inc.

B. Materials Description:
   1. Provide J-Hook system components that are plenum-rated (regardless of whether air plenum ceilings exist on the project). Provide J-Hooks, not Cable Fasteners, and not Bridle Rings. Provide open-top hooks, so cables can be laid into J-Hooks rather than threaded through. Provide tool-less cable retainer clips (do not use cable ties). Provide hooks sized for maximum 40% fil (in cross section) based on outside diameter of cables. Accordingly, provide multiple sets of J-Hooks along any given pathway as applicable.
   2. Provide necessary factory hooks, cable retainers, fasteners, attachment kits, etc. as required for complete installations.

2.2 MATERIALS AND FINISHES

A. Provide steel units with rolled hook edges to prevent damage to cable jackets and insulation.

B. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.

C. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide J-Hook support along “free-air” cable pathway routes. Provide J-Hooks at four-foot intervals and at offsets. Route J-Hooks above ceilings through corridors and similar open areas wherever possible to minimize above-ceiling wall penetrations.

B. Layout and install all electrical work in strict compliance with Chapter 1, Part B, Section 110.26 of the latest adopted edition of NFPA 70. Locations and routing that may be shown on plans are schematic and diagrammatic in nature. Layout all proposed pathway routing, elevations, installation methods, etc. on coordination drawings and coordinate all proposed routing with all affected trades prior to commencing with work. In addition, review the information with Owner and Design Professionals for all areas where pathways will be visible after completion of construction, to ensure a neatly organized installation occurs. Where exposed in finished areas, install in a manner that minimizes detrimental effects on room aesthetics. Install as out of site as reasonably possible.

C. Keep pathways at least 24 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal runs above liquid and steam piping. Level and square runs, and install at proper elevations and heights. Do not begin installation of cables unit J-Hook pathway installations are complete and until installations locations (end to end) are in a weatherproof environment. Install pathways so that they are accessible for cable installation after construction is complete. Install pathways with enough workspace to permit access for installing cables. Strictly adhere to factory load capacities and fill capacity. Provide factory cable retainers, fasteners, attachment kits, and other accessories as required for a complete installation.

D. Securely anchor (mechanical, not adhesive) J-Hooks directly to structural components of the building. Do not anchor J-Hooks to ductwork, conduit, piping, fixtures, equipment, ceiling supports (rods, wires, T-bars), etc. Comply with requirements in Section 260529 and related sections for hangers and supports. Support using factory-approved methods. Fasten cables on horizontal runs with factory cable clamps, retainers, fasteners, attachment kits or flexible Velcro-secured wraps compliant with to NEMA VE 2. Tighten clamps/wraps only enough to secure the cable, without indenting the cable jacket. Use of synthetic or plastic “tie-wraps”, “zip ties”, “wire ties” and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices equipment or other electrical work. Do not use perforated strap.

E. Coordinate work prior to rough-in with respective equipment and cable installers, and with Owner’s Representative. Carefully coordinate proposed routing, including elevations, with affected installers and entities prior to rough-in. Neatly route paths parallel and perpendicular to building architectural lines, plumb on walls, and at a consistent elevation wherever possible. Install paths in a uniform plane/elevation wherever possible. Keep horizontal and vertical offsets to an absolute minimum. Route paths so that a minimum of 24 inches exists between cables and potential EMI sources such as lighting ballasts, motors, power wiring, dimmer circuits, etc.

F. Provide a minimum of two (2) 4-inch bushed conduit sleeves where pathway is routed above inaccessible ceilings, and at penetrations of floors, masonry walls, fire rated walls, smoke-tight partitions, smoke-related partitions, and similar elements. Provide smoke and fire stopping at such penetrations as applicable in (see Section 260502). Provide EMT conduit for “drops” from

paths to outlets and equipment, with sweep bends, insulated throat fittings and 200-pound pull string.

END OF SECTION 26 0537

SECTION 26 0543 – PULLBOXES, UNDERGROUND DUCTS AND RACEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Flush grade pullboxes.

1.2 SUBMITTALS

A. Product Data: For accessories for boxes.

B. Shop Drawings for Factory-Fabricated Handholes and Boxes: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.

C. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: Type EPC-40-PVC Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Utilize galvanized rigid steel for 90 degree bends (long sweep type) with proper adapters between PVC duct and galvanized steel.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cantex, Inc.
2. CertainTeed Corp.; Pipe & Plastics Group.
3. Heritage Plastics.
4. Carlon Electrical Products.
5. Manhattan/CDT; a division of Cable Design Technologies.
6. Spiraduct/AFC Cable Systems, Inc.

B. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, to provide minimum duct spacings while supporting ducts during concreting or backfilling.

2.3 HANDHOLES AND BOXES

A. Description: Comply with SCTE 77.

1. Color: Gray /Green.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, As indicated for each service**.**
6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer Handholes and Boxes: Molded of fiberglass-reinforced polymer concrete, with matching covers.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carson Industries LLC.
b. Quazite (Hubbell).
c. Highline Products, Inc.

PART 3 - EXECUTION

3.1 EARTHWORK AND RESTORATION

A. Refer to Division 26 Section “Excavation, Backfill and Surface Restoration”.

3.2 DUCT INSTALLATION

A. Slope: Pitch ducts toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends at other locations, unless otherwise indicated.

C. Joints: Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.

E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

F. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

G. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
3. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
4. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
5. Identify Ductbank with one of the following methods:

    a. Mark the top of all underground duct runs with concentrated red dye or powder on top.

    b. Provide 6” wide yellow plastic tape, with black letters indicating “Electric”; place approximately 18” above and continuously along the centerline of duct bank.

3.3 INSTALLATION OF CONCRETE MANHOLES

A. Comply with ASTM C 891, unless otherwise indicated.

B. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.

C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

3.4 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: Set covers of handholes 1 inch above finished grade and boxes with bottom below the frost line.

D. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 CLEANING

A. Pull mandrel through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 26 0543

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Wiring device circuit identification.
3. Warning labels and signs.
4. Equipment identification labels.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WIRING DEVICE CIRCUIT IDENTIFICATION

A. Marker Tape: Self-laminating, clear polyester, 3/8” high tape with black lettering.

B. Provide label on every wiring device cover plate, indicating panel and circuit breaker fed from. Utilize 12 pt. font. Mount label on face of device cover plate, centered near the top .

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Phenolic Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 APPLICATION

A. Electrical and Auxiliary Systems Box, Conductor and Cable Identification: Use marker tape to identify field-installed branch circuit, alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.

2. Identify panel and branch circuit number(s) on all junction box covers permanently clearly printed with bold black indelible marker.

3. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Conduit and junction boxes:

1. Label panelboard and branch circuit number(s) on outside of junction box cover at all junction boxes containing branch circuit wiring. Labelling shall be neatly done utilizing black indelible ink markers.

2. Paint all junction boxes and covers for fire alarm wiring red.

C. Branch circuit panelboards:

1. Identify panel designation on directory card within the panel.

2. Fill out branch circuit directory indicating circuit number and area served, rooms, group of rooms, lighting, convenience outlets, motors, etc. Card index shall be neatly typed.
3. Replace branch circuit directory in existing panelboards in areas of alteration.
4. Branch circuit phase conductor color format shall be permanently identified inside each panelboard.

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated phenolic label. Unless otherwise indicated, provide a single line of text with 1/4-inch- high letters on 5/8-inch- high label; where 2 lines of text are required, use labels 1 inch high.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Electrical switchgear and switchboards.
c. Transformers.
d. Disconnect switches.
e. Enclosed circuit breakers.
f. Motor starters.
g. Lighting Relay Panel(s).

3. Label shall include equipment name, voltage and where fed from. Where equipment is located in finished spaces, accessible to the public, in addition to adhesive, secure labels with screws, one on each end.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded feeder, and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Neutral: White

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow
    d. Neutral: Grey.

END OF SECTION 26 0553

SECTION 26 0563 – SPECIFIC WIRING APPLICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Various items of equipment require additional electrical connections, wiring and/or interlocks that are not specifically identified on the drawings or in the specifications. Included, but not limited to, are the following items:

1. Gymnasium equipment
2. Mechanical/HVAC Equipment and motors.
3. Exterior Lighting Control Equipment.
4. Motorized Doors.
5. Security and Access Control Equipment.
6. Fire Protection/Suppression Equipment.

1.2 COORDINATION

A. Coordinate wiring requirements and interlocks for equipment provided by other Contractors. Obtain copies of approved Shop Drawings and/or manufacturer's wiring diagrams to determine exact wiring requirements.

B. This Contractor shall inquire of the Engineer during bidding, or at the earliest practical date, any questions which may arise regarding the intention and scope of this work.

PART 2 - PRODUCTS

2.1 Materials and equipment shall be as indicated on the drawings and in the specifications.

PART 3 - EXECUTION

3.1 Final connections to fixture pigtails shall be made with approved pressure connectors such as IDEAL “Twister” or T&B “Freespring Winged”.

3.2 Miscellaneous Equipment Connections

A. Various items of equipment such as kitchen, laboratory, laundry, HVAC, Plumbing, etc. will be furnished and set in place by other trades. This equipment, unless otherwise shown on the drawings, will be furnished with necessary electrical outlets, operating and control switches, terminating in an electrical outlet box, or equivalent electrical connector located on the equipment. This contractor shall furnish power wiring to these various items of equipment and connect them up complete for full operation.

B. Where disconnect switches are indicated or where otherwise required, they shall be mounted in an accessible location. In the case of labs, laundries and finished areas, provide NEMA 4X Stainless Steel enclosure and locate in as inconspicuous a place as possible. Locate disconnect switches under counters where feasible and accessible in lieu of above counter, however, this contractor shall ensure that the installation of equipment does not interfere with access and operation of such switches.

C. Where necessary to expose conduit in finished spaces, rigid aluminum conduit and conduit body ("LB") fittings shall be utilized.

D. Coordinate and provide any additional 120 volt power connections required for special low voltage systems devices or equipment panels such as Security System/Door Access System control panels, door strikes, surveillance cameras, security/fire shutters or doors, temperature control system panels/transformers, etc.

E. Roughing-in drawings for equipment shall be obtained from the Architect or Contractor providing the equipment with substantial time prior to the installation of such equipment to enable proper electrical rough-in equipment.

3.3 Miscellaneous Wiring Interlocks

A. Various items of work are required in connection with interlocking motor and starter/VFD operations and providing wiring to serve equipment which is furnished by other trades.

B. Interlocks between motor controllers for purposes of accomplishing sequence control or simultaneous operation of motors are all to be included in the Electrical Contract. Requirements for a simple simultaneous motor operation interlock are indicated by a schedule on the drawings or by specific notes. These interlocks consist of auxiliary contacts on the starter/VFD of the lead motor wired in, according to standard diagrams of the motor starter/VFD manufacturer to energize the holding coil of the starter or VFD control input for the motor. These interlocks shall be thru the "automatic" position only of the starter/VFD where HOA switches are supplied. Furnish extra contacts on external relays as required for interlocks. Where interlocks, other than the simple sequence above, are required, they shall be as described as follows in this section.

C. The following is a list of equipment and systems requiring wiring. Note that these are in addition to standard interlocks scheduled on the drawings.

1. Exterior lighting control shall consist of a combination multiple circuit contactor and photoelectric cell system furnished by this Contractor. Provide photoelectric cell, arranged and wired to turn on and off lights automatically at a pre-determined light level. The photocell shall be mounted on the North wall of the building, facing North, away from interfering light sources and wired to the contactor/controller assembly.Control circuit shall operate electrically-operated, electrically held contactor to control lights. Provide auxiliary relay with contactor where required. Where the drawings indicate a different configuration/assembly for exterior lighting control, the drawings shall take precedence.

2. Motorized backdraft dampers on exhaust fans and power roof ventilators shall be connected to their respective associated motor leads to energize the backdraft damper motor and open the damper when the fan operates. Dampers, operator and transformer, if required, will be furnished by the fan supplier, install transformer and wire to damper.

3. Motorized Doors: Door controls, including door switches (pressplates, prox sensors, etc.), limit switches, relays, etc. will be furnished by the door equipment supplier. This equipment shall be turned over to the Electrical Contractor and installed for a complete and operational motorized door operator system per the equipment supplier wiring diagrams. Provide additional boxes, conduit and wiring as required per the supplier's diagrams and to meet field conditions. Where motorized door operators are located in fire walls and/or smoke partitions, provide a signal from the fire alarm system to disable the door controls to allow it to be manually operable while maintaining it's latching feature. Where motorized door operators are located on exterior doors and are required to open doors for smoke evacuation, provide a signal from the fire alarm system to open and hold doors during the course of smoke evacuation sequence.

4. Independently mounted controllers furnished by others: Where starters/VFD's are furnished by other trades, and are required to be mounted remote from the motor, the Electrical Contractor shall accept and mount them and perform all power and control wiring between the controls and motors indicated. Motor controllers equipped with automatic alternators shall have two independent circuits and control sources to preclude loss of operation when one circuit fails.

5. Pre-Action or dry-pipe fire suppression panel(s) will be provided by the Fire Suppression Contractor. In addition to the required fire alarm system monitoring/control devices specified elsewhere in this specification, this Contractor shall provide any necessary 120 volt emergency power supply to panel for control and/or integral air compressor.

END OF SECTION 26 0563

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1: GENERAL

1.0 Section Includes
- A. Lighting Control Components and Systems:
    1. Line Voltage Wall Switches Low Voltage Wall Switches and Sensors
    2. Occupancy / Vacancy Sensors Detection
    3. Power Interfaces
    4. Line Voltage Wall Switches and Sensors
    5. Wireless Devices and Systems

1.1 Related Requirements
- A. Section 262726 Wiring Devices
- B. Section 265113 Interior Lighting

1.2 References
- A. Underwriters Laboratories (UL):
    1. UL 916- Energy Management Equipment
    2. UL 924 - Emergency Lighting and Power Equipment
    3. UL 1472 – Standard for Safety Solid-State Dimming Controls
- B. National Fire Protection Association (NFPA):
    1. NFPA 70 - National Electric Code
- C. IEC 61000-4-2 Electromagnetic Compatibility (EMC) – Part 4-2: Testing and Measurement Techniques-Electrostatic Discharge Immunity Test; 2008
- D. NEMA WD 7-2011: Occupancy Motion Sensors
- E. NEMA SSL 7A: Phase Cut Dimming
- F. FCC Part 15 and equivalent ISED / NOM

1.3 Administrative Requirements
- A. Coordination
    1. Coordinate placement of daylight and occupancy sensors to achieve optimum performance. Proper sensor placement should be coordinated with others to avoid obstructions that would interfere with maintaining prescribed light levels
    2. Coordinate the work to provide luminaires and lamps that are compatible with the lighting controls to be installed
    3. Notify architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work

1.4 Submittals
- A. Submit under provisions of Section 26 0001
- B. Shop Drawings include
    1. Floor Plan(s) showing device and accessories layout
    2. System schematic/typical riser diagrams
- C. Product Data Sheets

1.5 Project Closeout Documentation

A. Provide a factory published manual
    1. Warranty
    2. Technical support contact
    3. Electronic manual on manufacturer's website for free download

1.6 Quality Assurance
A. Manufacturer Qualifications:
    1. Remote Support: Manufacturer capable of providing remote support and ability to virtually connect with customers to address issues.
    2. On-Site Support: Manufacturer capable of providing on-site response time within the continental United States
    3. Service Contracts: Manufacturer capable of providing service contracts for continued on-site and remote support of the lighting control system post-installation for terms up to 10 years from substantial completion.
B. All devices are 100% factory function tested prior to delivery
C. Compliant with the requirements of NFPA 70
D. All power components UL listed for required loads

1.7 Project Conditions
A. Only install equipment after the following site conditions are maintained:
    1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C); unless specified extended temperature operation within the product specification sheet.
    2. Relative Humidity less than 90% non-condensing
B. Standard electrical enclosures are permanently installed
C. Equipment is protected from dust, debris and moisture

1.8 Warranty
A. Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace (same device or equivalent), materials, and devices that fail to perform as specified within extended warranty period.
B. Five (5) years from the date of shipment

PART 2: PRODUCT INFORMATION

2.1 Manufacturers:
A. Low Voltage
    1. SensorSwitch
    4. Current
    5. Leviton
    6. Wattstopper
    7. Sensorworx
    8. Acuity-NLight
    9. Crestron
B. Line Voltage
    1. Refer to "26 2726 Wiring Devices" section for acceptable Manufacturers

2.2 General:

A. Provide system hardware that is designed, tested, manufactured, warranted by a single manufacturer
B. Operational Life: At least 10 years expected life while operating within the specified ambient temperature and humidity range
C. Power Failure Memory: automatically store system settings and recover from a power failure without requiring user input.

Occupancy Detection Technology Requirements:

D. The occupancy sensor system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
E. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or based sensing technologies shall not be accepted.
F. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional "dual" technology shall be used.
G. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 10 minutes.
H. Allow adjustments to the occupancy time delay based on owner preference, fixture life extension or increase energy savings. Should be done in consultation with the building owner and specifying engineer.
I. Installer, in accordance with manufacturer's recommendation, shall determine final sensor location. All sensors shall be factory calibrated for optimum performance for its installed PIR lens, and shall not require initial or subsequent field adjustment of detection sensitivity.
J. All sensor setting adjustments shall be digital; comprising of a one or more user interfaces: Push-button, Visual Light Infrared, RFID or Bluetooth Programming methods
K. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

2.3 Low Voltage Wall Switches

A. Shall be capable of the following:
    1. Accept 12-24VAC/VDC
    2. Suitable for installation in a single-gang switch box
    3. Support On / Off / Dimming and 3-way Connection
    4. Single and dual pole options
    5. Programmable via push button programming with visual LED visual feedback

2.4 Line Voltage Wall Switches

A. Shall be capable of the following:
    1. Shall accept Class 1 wiring directly.
    2. Devices will operate as On / Off and Dimming (pending model variant)
    3. Dimming devices shall be 0-10V sink devices
    4. Multi-way switches allow for 3-way, 4-way and up to 9 connections.
    5. All Multi-Way devices On / Off loads will operate and respond in unison.

6. Multi-way devices with dimming loads will operate in unison when initiated by a dimming device

7. Multi-way device is a class 1 low voltage data bus and must not be used with a standard toggle switch.

8. Count down timer capabilities

9. Single and dual pole options

B. Phase Dimming Wall Switches;

Shall be capable of the following:

1. Shall accept Class 1 wiring directly.

2. Devices will operate on / off and dimming LED load types

3. Compatible with NEMA SSL 7A

C. Line Voltage Wall Switch with Occupancy Sensor

A. Sensor shall provide wall-to-wall PIR occupant movement supporting small (hand motions) and large (walking motion) detection .
B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology detection shall be used (as specified in above section 1.1, Occupancy Sensor Technology Requirements).
C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
D. Sensors shall be capable of switching both 120 VAC and 277 VAC (models allowing 120-277 VAC input) and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
E. Light Commercial devices will be designated as 120 VAC and lower load rating compared to commercial based products.
F. Sensor shall recess into single gang switch box and fit a standard GFI opening.
G. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection internally and intrinsically through its mounting strap.
H. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
I. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology (only exception is versions with lighted push-buttons).
J. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (off) condition. Sensor shall not require a minimum load to be connected to function.
K. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, low temperature/high humidity operation.
L. All sensor settings, including time delay and photocell settings shall be digital and accessible for adjustment via one or more user interfaces.
M. Wall Switch sensors shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point as applicable.
N. All models shall be capable of both Auto-On, Manual On, and Partial-On operation.

O. All models shall be capable of a “Reduced Turn On” operation where the initial PIR turn on level is higher in order to eliminate PIR from reflective surfaces from being detected. PIR shall be returned to normal levels upon initial PIR detection.
P. All models shall have a “Predictive Off” mode where user can manually turn the lights off when leaving the room and still have them come on automatically when they return to space.
Q. All models shall be capable of disabling override switch.
R. Multiple switches controlling the same load (3-way or 4-way applications) shall use multi-way based devices.

2.5 Wall Switch Occupancy Sensors – Large Areas

A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 40 ft (12.19 m).
B. In areas with periodic or permanent obstruction to a sensor’s field of view, sensors that utilize dual technology detection shall be used (as specified in above section 1.1, Occupancy Sensor Technology Requirements).
C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz Load ratings shall be 13A each pole, ¼ HP motor load.
E. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
F. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
G. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology.
H. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (Off) condition. Sensor shall not require a minimum load to be connected in order to function.

2.6. Low Voltage Occupancy Sensors

A. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer’s best practice recommendations.
B. In areas with periodic or permanent obstruction to a sensor’s field of view, sensors that utilize dual technology detection shall be used (as specified in above section 2.2, Occupancy Sensor Technology Requirements).
C. Sensors shall interconnect with other sensors and power/relay packs with class 2, three-conductor wire.
D. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 mA so that up to 14 sensors may be connected to a single power pack.
E. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.
F. Each designated zone shall contain one sensor with a SPDT class 2 auxiliary relay, providing an input to building automation system (BAS). All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that power pack must be installed on the Line side of the local toggle switch for auxiliary relay to work properly.

G. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
H. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
I. Sensors with a recessed profile are acceptable substitutes for above ceiling mount sensors

2.7 Power Packs

A. Power packs shall accept and switch 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.
B. Power pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
C. When required by local code, power pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
D. Power pack shall incorporate a Class 1 relay and an AC electronic switching device. The AC electronic switching device shall make and break the load, while the relay shall carry the current in the on condition. This system shall provide full 20 Amp switching of all load types, and be rated for a minimum of 300,000 cycles.
E. Power packs shall be single circuit, or two circuits. Slave packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.
F. A dry contact relay to connect BMS, HVAC, Fan, etc., shall be provided.

2.8 Line Voltage Occupancy Sensors

A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack.
B. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer’s best practice recommendations.
C. In areas with periodic or permanent obstruction to a sensor’s field of view, sensors that utilize dual technology detection shall be used (as specified in above section 2.2, Occupancy Sensor Technology Requirements).
D. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
E. Multiple sensors controlling the same load shall be wired in parallel.
F. For applications requiring independent control of two loads, a sensor with two dual relays shall be required. Each relay shall have independent programmable occupancy time delays.
G. Dual relay sensors shall have an optional operational mode called “Alternating On” where when during unoccupied periods, one relay is always left closed (thus one load is always on). The

particular relay that is left closed alternates each cycle so that the aging of the connected lamps is even.

H. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.

I. Specific sensors capable of switching 5 Amps of two-phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.

J. Wall mounted sensors must be installed at 7 to 8 feet above the floor. Single and two circuit units shall be available.

K. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.

L. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.

M. Sensor settings may be programmed via pushbutton or via mobile application.

N. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors.

2.9 Indoor Photocells and Daylight Harvesting Controls

A. Low voltage photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.

B. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.

C. Photocell set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Further adjustment may be made manually if needed.

D. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

E. Low voltage dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable drivers.

F. Low voltage dimming sensor's set point shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.

G. Combination photocell/dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the on/off function as well as the dimming function of 0 to 10 VDC dimmable drivers.

H. Combination photocell/dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set point may be manually entered.

I. Dual zone option shall be available for photocell, dimming, or combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.

J. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
K. Line voltage versions of the above described dimming sensors shall be capable of powering off 120/277 VAC.
L. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching 5 Amps of two phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
M. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors

PART 3: EXECUTION

3.1 Installation
A. Follow manufacturer's instructions for all installation steps
B. Provide a complete installation per Contract Documents
C. Where applicable proved FAQs and Quick Start Guides

3.2 Startup and Programming
A. Provide telephone support via toll free line
B. Factory trained service available for purchase
C. Where applicable training video and elearning content

3.5 Maintenance
A. Factory trained service technicians available within the continental US
B. Offer integrated help on-screen and via online videos
C. Factory telephone support via toll free line

END OF SECTION

SECTION 26 2213 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Indicate dimensions and weights.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Field quality-control test reports.

E. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACME Electric Corporation; Power Distribution Products Division.
2. Eaton Electrical Inc.; Cutler-Hammer Products.
3. Siemens Energy & Automation, Inc.
4. Sola/Hevi-Duty.

5. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper or aluminum

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: ANSI 49 gray.

F. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.

G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

I. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

J. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.

2. Indicate value of K-factor on transformer nameplate.

K. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

L. Wall Brackets: Manufacturer's standard brackets.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic nameplate. Nameplates are specified in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Division 26 Section "Hangers and Supports for Electrical Systems."

C. Furnish and install a vibration isolation pad at each corner of each transformer to isolate from structure or support frame. Vibration isolation pads shall be selected for appropriate weight and bearing area; by Mason or B-Line or equal.

3.2 ADJUSTING

A. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Panelboard schedules for installation in panelboards.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and/or surface-mounted cabinets, as indicated on the drawings.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen/Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and/or bottom as Project condition dictates.

C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. Siemens.
3. Square D.

2.2 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, power and feeder distribution type.

B. Doors: Secured with vault-type 3 point latch with tumbler lock; keyed alike.

C. Mains: Circuit breaker as identified on the drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit breaker and/or lugs only as identified on the drawings. Sized to have 225 amp bussing unless indicated otherwise on drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. Sized to accommodate 42 poles unless indicated otherwise on drawings. Furnish number of breakers shown.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents listed on the drawings.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
5. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
6. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles. Where more than one pole is used, they shall employ a common trip.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits. Type HACR for feeding heating, air conditioning and refrigeration equipment.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Shunt Trip: 120 -V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of lighting and appliance panelboard trim 72 inches above finished floor; distribution panelboard trim 90 inches above finished floor, unless otherwise indicated.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges and ground fault settings as applicable.

E. Install filler plates in unused spaces.

F. Stub four 1-inch empty conduits from flush mounted panelboard into accessible ceiling space or space designated to be ceiling space in the future.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room, area or equipment designations. Temporary conditions of occupancy shall not be utilized as circuit descriptions. Indicated spare circuits shall be specifically labeled as such. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 2416

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall-box motion sensors.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and interior occupancy sensors.
6. Communications outlets.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Eaton Industries, Inc. (Cooper/Arrow Hart).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Legrand).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), 5352 (duplex).

b. Hubbell; 5361 (single), 5362 (duplex).
c. Leviton; 5351 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. All receptacles installed outdoors shall be weather resistant type.

C. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper.
b. Pass & Seymour/Legrand.
c. Leviton.
d. Hubbell.

2.4 TAMPER RESISTANT STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, NEC 406.12 & 517.18(C) and UL 498.

B. Where indicated on plans to provide Tamper Resistant type receptacle, device shall have non-conductive dual mechanical shutter mechanisms on 120V connection ports, compliant with NEC requirements. This is in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, etc.).

2.5 USB CHARGING TYPE RECEPTACLES

A. Convenience Receptacles, 125V, 20A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498.

B. Where indicated on plans to include USB Type Charging ports, device shall include Dual-Port USB Type A-C charging ports with minimum 5 Amps combined charging power (minimum 25 watts), in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, Tamper-resistant, etc.).

2.6 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.7 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, 0-10V, solid-state units with integral, quiet on-off switches. Unit listed and compatible for type of lighting controlled and rated for connected load unless larger rating is indicated for future capacity.

B. Control: Continuously adjustable slider, with separate on-off switch; single-pole or three-way switching capability. Comply with UL 1472.

2.8 OCCUPANCY SENSORS

A. Refer to Section 26 0923 Lighting Control Devices

2.9 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Nylon.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.
1. Outdoor receptacle covers shall be “In Use” type rated “Extra Duty”.

2.10 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices: White, unless otherwise indicated or required by NFPA 70 or device listing.

2. Device plates: Nylon, white to match color of wiring devices in finished spaces; stainless steel in gym and weight room areas..

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.
5. All 15 or 20 amp-120V wiring devices located within 6 feet from the edge of a sink, located in Kitchens or Bathrooms or serving electric water cooler shall be GFCI protected type device.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
3. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
3. When there is a choice, use side wiring with binding-head screw terminals.
4. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
5. Tighten unused terminal screws on the device.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that controls used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 "PLUG CONNECT/PLUG TAIL" DEVICES

A. In lieu of terminal screw connected receptacles and switches as specified above, specialized plug-in type devices may be provided as long as it is offered by the same manufacturer and listed equivalent to the same product line specified. Permanent wiring pigtails shall be of sufficient length to enable replacement of device with standard terminal screw type device as required by Code.

B. Where plug-in type wiring devices are provided, furnish a minimum of five (5) of each type and color device installed to the Owner as spares. Where more than one hundred (100) of any type is installed, provide a minimum of ten (10) spare devices.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 26 2726

SECTION 26 2813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cartridge fuses rated 600-V ac and less for use in, enclosed switches, panelboards, enclosed controllers and motor-control centers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Bussman, Inc.
2. Mersen.
3. Littelfuse.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Feeders: Class RK1, time delay.

B. Motor Branch Circuits: Class RK1, time delay.

C. Other Branch Circuits: Class RK1, time delay.

D. Control Circuits: Class CC, fast acting.

3.2 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Provide a minimum of 3 spare fuses of each size/type installed and turn over to Owner.

3.3 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 26 2813

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE/NON-FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. Siemens.
3. Square D.

B. All starters and disconnect switches shall be of the same manufacturer unless otherwise approved.

C. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses specified when so indicated on the drawings, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. Siemens.
3. Square D.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
4. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
5. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen/Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at 6’-0” A.F.F. unless otherwise indicated.

B. Install fuses in fusible devices.

C. Coordinate location of devices to allow working clearances and to avoid interference with other equipment and trades.

D. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION 262816

SECTION 26 2913 - ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ac, enclosed controllers rated 600 V and less, of the following types:

1. Across-the-line, manual and magnetic controllers.
2. Multispeed controllers.

B. Refer to “Disconnect Switches” section for switch requirements.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed controllers, minimum clearances between enclosed controllers, and for adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

D. Motor starters and disconnects shall be manufactured and rated in accordance with NEMA, UL and IEEE Standards. IEC rated contactors and overloads are not acceptable.

1.3 COORDINATION

A. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley Co (Bulletin 509)
2. Cutler-Hammer (Class AN16).

3. Siemens (Class 14).
4. Square D Type S (Class 8536).
5. ABB.

2.2 ACROSS-THE-LINE ENCLOSED CONTROLLERS

A. Manual Controller: NEMA ICS 2, general purpose, Class A, with "quick-make, quick-break" toggle or pushbutton action, and marked to show whether unit is "OFF," "ON," or "TRIPPED." Manual Controllers furnished for fractional horsepower, single phase motors unless otherwise indicated on plans.

1. Overload Relay: Ambient-compensated type with inverse-time-current characteristics and NEMA ICS 2, Class 10 tripping characteristics. Relays shall have heaters and sensors in each phase, matched to nameplate, full-load current of specific motor to which they connect and shall have appropriate adjustment for duty cycle.

B. Magnetic Controller: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated. Provide Magnetic Controllers on all motors one horsepower and greater or any 3 phase motor, unless indicated otherwise on plans.

1. Control Circuit: 120 V; obtained from integral control power transformer with a control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity. Provide fusing on control transformer primary and secondary, each phase, and grounded on the secondary.
2. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 20 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.
3. Adjustable Overload Relay: Dip switch selectable for motor running overload protection with NEMA ICS 2, Class 30 tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.

C. Combination Magnetic Controller: Factory-assembled combination controller and disconnect switch.

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by an NRTL. Provide fusible disconnect only where specifically indicated on the drawings or where required by Code.
2. Nonfusible Disconnecting Means: NEMA KS 1, heavy-duty, nonfusible switch.
3. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

2.3 MULTISPEED ENCLOSED CONTROLLERS

A. Multispeed Enclosed Controller: Match controller to motor type, application, and number of speeds; include the following accessories:

1. Compelling relay to ensure that motor will start only at low speed.
2. Accelerating relay to ensure properly timed acceleration through speeds lower than that selected.
3. Decelerating relay to ensure automatically timed deceleration through each speed.

B. Two-speed starters: Shall be two-winding with adjustable time delay on high to low speed. The E.C. shall verify that starter is compatible with the motor that is being furnished.

2.4 ENCLOSURES

A. Description: Flush- or surface-mounting cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated.

1. Outdoor Locations: NEMA 250, Type 3R.

2.5 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, LED Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. A Hand-Off-Auto selector switch shall be mounted in the face of each starter enclosure. The selector switch shall be so wired that when it is in the Hand or Auto position, all safety controls are wired in series with the selector switch. All control devices shall be wired in the Auto position only.

D. Provide a green LED pilot light mounted in the face of enclosure. Wire pilot light so that light will be on when motor is energized.

E. Provide a red LED pilot light mounted in the face of enclosure. Wire pilot light so that light will be on when starter power supply is energized.

F. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock control circuit open.

G. Control Relays: Auxiliary and adjustable time-delay relays. Provide adjustable 0-60 second “on” time delay relay on starters where indicated on drawings and wire into the “Auto” position of the selector switch to delay starting.

H. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting. Provide on all 3 phase motor starters 5 HP and larger; wire ahead of the H-O-A switch.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, controller, and load; and configuration of pilot device and control circuit affecting controller functions.

3.2 INSTALLATION

A. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide floor set unistrut frame to mount adjacent to equipment being controlled. Allow proper service clearances to equipment.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.3 IDENTIFICATION

A. Identify enclosed controller, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Bundle, train, and support wiring in enclosures.

B. Install all other control and interlock wiring in the field that cannot be factory pre-wired and is indicated on the plans or other specification sections as wired by the Electrical Contractor.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.

1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.
3. Test electrical phase rotation of 3-phase supply feeders.

B. Perform the following field tests and inspections and prepare test reports:

1. Correct malfunctioning units and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 26 2913

SECTION 26 4313 – SURGE PROTECTIVE DEVICES (SPD) FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes SPD's for low-voltage power equipment.

1.2 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer. Manufacturer shall have been engaged in the manufacture of SPD products specified and products shall have been in satisfactory service for not less than 5 years.

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 IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."

D. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

E. Comply with UL 1283 5th Edition, "Electromagnetic Interference Filters," and UL 1449 3rd Edition, "Surge Protective Devices."

1.3 PROJECT CONDITIONS

A. Service Conditions: Rate surge protection devices 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 120 deg F.
3. Humidity: 0 to 85 percent, non-condensing.
4. Altitude: Less than 20,000 feet above sea level.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies, Inc. (ASCO)
2. Current Technology, Inc. (ABB)
3. Cutler-Hammer, Inc. (Clipper)
4. Liebert Corporation.
5. Thor Systems, Inc.
6. Siemens Energy & Automation, Inc.
7. Square D.
8. LEA International.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. Fuses/circuit breaker, rated at 200-kA interrupting capacity.
4. Integral disconnect switch or circuit breaker to isolate entire suppressor components for repair/replacement.
5. Redundant suppression circuits.
6. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: 150kA per mode (300 kA per phase).

C. Connection Means: Permanently wired.

D. SPD and overcurrent/disconnect device shall have a short circuit current rating greater than that available on the electrical system.

E. Protection modes and UL 1449 voltage protection rating compatible with system voltage and configuration as indicated on the drawings for complete protection as follows:

1. Line to Neutral.
2. Line to Ground.
3. Neutral to Ground.

2.3 PANELBOARD SUPPRESSORS

A. Same characteristics and requirements as service entrance suppressors with the following exceptions:

B. Surge-event operations counter not required.

C. Peak Single-Impulse Surge Current Rating: 65kA per mode (130 kA per phase).

2.4 ENCLOSURES

A. NEMA 250 (or better), with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible (not to exceed 18 inches). Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. Twist input conductors together to reduce system inductance.

1. Provide multipole circuit breaker or fusible disconnect switch as a dedicated disconnect for suppressor, fuse size and type as recommended by SPD manufacturer.

3.2 PLACING SYSTEM INTO SERVICE

A. Do not energize or connect service equipment to their sources until surge protection devices are installed and connected.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field tests and inspections and document on test reports:

1. Complete startup checks according to manufacturer's written instructions.

END OF SECTION 26 4313

SECTION 26 5113 - INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, light engines (LED’s) and drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. See Division 26 Section "Wiring Devices" for manual wall-box dimmers for LED fixtures or lamps.

C. See Division 26 Section "Lighting Control Devices" for automatic control of lighting, including occupancy sensors, and multi-pole lighting relays and contactors.

1.2 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes and photometric data.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. LED Fixtures: Fixtures with LED light source are noted on lighting fixture schedule with advertised lumen output of light source for fixture/manufacturer specified and color temperature. Listed equal manufacturer shall provide fixture with equivalent lumen output as listed product. If insufficient information is provided, the Engineer may require Project Specific, point-by-point photometric calculations of sample areas utilizing the submitted fixture to prove equivalent performance.

D. Product Certificates: For each type of driver, signed by product manufacturer.

E. Utility Company Energy Rebate Programs

1. LED lighting fixtures shall be Energy Star or DLC listed to comply with local Utility Company Rebate Programs. Does not apply to track lighting fixtures. Fixture submittals that do not have either of these listings clearly indicated in the product data shall be rejected.

F. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. All LED fixtures and components shall be tested and comply under the standards of IESNA LM-79-08, LM-80-08, LM-82-12 and TM-21-11for measurement and publication of projected long term lumen maintenance, color stability, photometric performance and LED source operating lifetime. Fixture submitted shall meet the listed lifetime rating of the fixture specified, as a minimum.

1.4 WARRANTY

A. Provide a written, five year replacement material warranty for defective or non-starting LED source assemblies. Warranty period shall begin on date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Lighting Fixture Schedule the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified on drawing schedule.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with UL 1598 and NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Polymer Components: Plastic or polymer housing/components of fixture assemblies shall be rated for the temperature (or plenum) environment installed and shall not degrade in structural integrity, shape, color or finish for a minimum of 10 years.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit servicing without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position.

F. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
b. UV stabilized.

2. Glass: Tempered glass, unless otherwise indicated.

G. Servicing Access: Fixtures specified for installation in inaccessible (gypsum/drywall) ceilings/walls, etc. shall be fully serviceable/accessible from the fixture aperture.

H. Disconnecting Means:

1. Lighting fixtures with luminaires that utilize double-ended lamps and contain driver(s) that can be serviced in place or luminaires that are supplied from multi-wire branch circuits and can be serviced in place shall have a local disconnecting means at/within the fixture complying with NEC Article 410.75.

2.3 DRIVERS

A. Drivers for LED Light Sources:

1. Driver shall be separate component from LED light source and shall be replaceable utilizing mounting screws, factory provided clips and electrical connector bodies.
2. Dimming (When noted or indicated on Fixture Schedule): 100 to 1 percent of rated lumens via separate 0-10V input (Dimmer) control. Line voltage dimming acceptable when noted on plans.
3. Level Control/Step-Dimming (When noted or indicated on Fixture Schedule): Minimum capability of bi-level control (100%-50%-Off) or 1/3-2/3-Full on, as noted.
4. Voltage input: 120-277 Volt multi-volt capability.

B. Where plans call for multi-level switching/lighting, provide appropriate driver in fixture as required to accommodate the switching level arrangement of fixture.

2.4 EXIT SIGNS

A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

1. Light source for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
2. Voltage input: 120-277 Volt multi-volt capability.

2.5 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns luminaire on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Luminaire automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is

restored, relay disconnects luminaire from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Voltage input: 120-277 Volt multi-volt capability.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gauge.

C. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

D. Recessed fixtures shall be supported at minimum 2 corners, independent of each other, from structure above with steel #12 single jack chains. Additionally, securely fasten each fixture to the ceiling framing member by mechanical means such as bolts, screws, rivets or approved clips; install a minimum of one on each four sides of fixture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Single or Continuous Rows: Provide manufacturer required quantity of suspension cables at minimum intervals to support continuous row fixtures. The E.C. shall support suspended fixtures independently from the ceiling system and as specified by the fixture manufacturer.

D. Surface or Flush Lighting Fixture Support:

1. The E.C. shall coordinate fixture locations with the trade installing the ceiling system to assure support members are oriented and located to accommodate the lighting fixture layout.

2. Surface or flush fixtures in ceilings of the suspended lay-in type shall be installed so that the long dimension of the fixture is supported on the main support members of the ceiling system.

E. Luminaires installed in exposed or concealed locations under metal corrugated sheet roof decking shall be installed and supported so there is not less than 1-1/2” measured from the lowest surface of the roof decking to the top of the luminaire.

F. Adjust aimable lighting fixtures to provide required light intensities.

G. Where fixtures are suspended in Mechanical/Electrical/Storage/Technology or Utility spaces with no suspended ceiling, coordinate mounting heights and locations with exposed ductwork, piping, conduit/data cabling racks, equipment, etc. to provide optimal and even light distribution to service equipment.

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Where applicable, verify transfer from normal power to battery and retransfer to normal.

3.3 SPARE LAMPS/FIXTURES

A. Provide spare fixtures as noted on plans and schedules.

END OF SECTION 26 5113

SECTION 26 6102 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers fire alarm systems, including initiating devices, notification appliances, controls and supervisory devices.

B. Work covered by this section includes the furnishing of labor, equipment and materials for installation of the fire alarm system as indicated on the drawings and specifications.

C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

1. Fire alarm and detection operations.

2. Control and monitoring of fire suppression systems and other equipment as indicated in the drawings and specifications.

1.2 Acceptable Manufacturer

A. Manufacturer: The equipment and service described in this specification are those supplied and supported by Simplex Grinnell Base Bid). Alternate manufacturers and systems as noted on drawings.

B. Equipment manufacturer shall have a service organization within 60 miles of the project site and be a U.L. certified company. All equipment and materials necessary for proper operation of the system shall be deemed part of these specifications even if not specifically listed or described in this document.

1.3 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1 and 26 Specification Sections, apply to this section.

B. The work covered in this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:

1. Division 26: “Common Work Results for Electrical.”
2. Division 26: “Control Voltage Electrical Power Cables.”

C. The system and all associated operations shall be in accordance with the following:

1. Guidelines of the following Building Code: BOCA

2. NFPA 72, National Fire Alarm Code

3. NFPA 70, National Electrical Code

4. NFPA 101, Life Safety Code

5. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems

6. Other applicable NFPA standards

7. Local Jurisdictional Adopted Codes and Standards

8. ADA Accessibility Guidelines

1.4 System Description

A. General: In the Base Bid provide a complete, non-coded, addressable microprocessor-based extension of existing fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein. Alternate bib is for a totally stand alone system as noted on drawings.

B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download.

C. In the event of an operating power failure or an open or a grounded circuit in the system, a trouble signal and a trouble light shall be activated until the problem is corrected and the system is restored to normal. The trouble event shall be recorded in the system history log and printed on the system printer (when applicable). The trouble may be silenced by means of a button on the main control panel. Upon restoration of the system to a normal condition, the trouble light shall extinguish.

D. History Logs: the system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

E. Wiring/Signal Transmission:

1. Transmission shall be hardwired, using separate individual circuits for each zone of alarm operation as required or addressable signal transmission, dedicated to fire alarm service only.
2. System connections for initiating circuits and notification appliance circuits shall be Class B.
3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

F. Remote Access:

1. FACP shall have the capability to provide remote access thru a dial-up service modem using a public switched telephone system or a private switched telephone system.
2. A personal computer or laptop, configured with terminal emulation software shall have the ability to access the fire alarm control panel for diagnostics, maintenance reporting or information gathering.
3. FACP shall have the capability to provide Remote Access through a listed internet interface via a standard Web browser user interface

G. Required Functions:

1. Priority of Signals: Alarm events have the highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second, third and fourth level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even if the lower-priority condition occurs first. Annunciate all events regardless of priority or order received.

2. Non-interfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent activations.

3. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator and shall indicate the location and type of device.

4. General Alarm: A system general alarm shall include:

    a) Indication of alarm condition at the FACP and annunciator.
    b) Identification of the device or zone that is the source of the alarm at the FACP. Identification shall include initiating device address; device type, and device location including floor, room name, and room number.
    c) Operation of audible and visible notification devices throughout the building until silenced at FACP or annunciator.
    d) Closing doors normally held open by magnetic door holders.
    e) Shutting down supply and return fans serving zone where alarm is initiated.

5. Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch and tamper switch, the system shall operate as follows:
    a) Activate the system supervisory service audible signal and illuminate the LED (display) at the control unit and the graphic annunciator.
    b) Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED “on” indicating abnormal condition.
    c) Record the event in the FACP historical log.
    d) Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.

6. Alarm Silencing: If the “Alarm Silence” button is pressed, all audible devices shall cease operation and the visual devices will continue to flash until acknowledged.

7. System Reset:
    a) The “system Reset” button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps (“IN PROGRESS”, “RESET COMPLETED”) as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate “ALARM PRESENT, SYSTEM RESET ABORTED.”
    b) Should an alarm condition continue, the system will remain in an alarmed state.

8. Walktest: the system shall have the capacity of eight (8) programmable, pass-code protected, one person testing groups, such that only a portion of the system need be disabled during testing.

9. Automatic Alarm Sequence:

    a) The automatic alarm signal shall consist of a Code-3 temporal pattern (master coded) audible fire alarm signal and illuminate fire signal lights in a synchronous mode until alarms have been silenced at the main fire alarm system control panel or at a remote operator’s control panel by means of the “alarm silence” switch; or the device returned to normal and a “reset” switch is manually actuated.

10. Operating Power Failure:

    a) In the event of an operating power failure or an open or a grounded circuit in the system, a trouble signal and trouble LED shall be activated until the system is restored to normal. The trouble event shall be recorded within the control panel history trouble log and printed on the system printer (if applicable). The trouble signal may be silenced by means of a button located on the control panel operator’s interface. Upon restoration of the system to normal condition, the trouble indicator(s) shall automatically extinguish.

H. Analog Smoke Sensors:

1. Monitoring: The FACP shall individually monitor sensors for calibration, sensitivity and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

2. Environmental Compensation: The FACP shall maintain a moving average of the sensor’s smoke chamber value to automatically compensate for dust, dirt and other conditions that could affect detection operations.

3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.

4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a display monitor or printed for annual recording and logging of the calibration maintenance schedule.

5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported at the Remote Annunciator. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.

6. The FACP shall continuously perform an automatic self-test on each sensor, which will check sensor electronics to ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.

8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.

9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

I. Fire Suppression Monitoring:

1. Water flow: Activation of a water flow switch shall initiate general alarm operations.

2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.

3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.

J. Power Requirements:

1. The control unit shall receive AC power via a dedicated circuit.

2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.

3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.

4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green “power on” LED shall be displayed continuously while incoming power is present.

5. The system batteries shall be supervised so that a low battery or depleted battery condition or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.

6. The system shall support NAC Lockout feature to prevent subsequent activation of NA Circuits after a depleted battery condition occurs in order to make use of battery reserve for front panel annunciation and control.

7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.

8. Loss of primary power shall sound a trouble signal at the FACP. The FACP shall indicate when the system is operating on an alternate (battery or generator) power supply.

1.5 Submittals

A. General: Submit the following according to conditions of contract and Divisions 1 and 26 Specifications sections.

1. Product data sheets for system components highlighted or marked to indicate the specific products, features or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds or does not comply with this specification.

2. Wiring diagrams from Manufacturer’s Vendor.
    a) Shop drawings showing system details including location of FACP, all devices, circuiting and details. Submittal drawings shall include riser diagrams or schedules including initiating device address; device type, and device location including floor, room name, and room number.

3. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.

4. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system

inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, sensor and auxiliary control circuits.

5. Operating instructions for FACP.

6. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type of product, including all features and operating sequences, both automatic and manual. Provide the names, addresses and telephone numbers of service organizations.

7. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with specified requirements.

8. Record of field tests of system.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

1.6 Quality Assurance

A. Installer Qualifications: A factory authorized installer with the appropriate NICET level certification for installation is required to perform the work of this section.

B. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by UL Inc. and shall bear the UL label.

1.7 Extra Materials

A. General: Furnish extra materials, packaged with protective covering for storage and identified with labels clearly describing contents as follows:
1. Strobe units: Furnish quantity equal to ten (10) percent of the number of units installed, but not less than one (1), plus 50 ft. of wire and conduit, installed at the Engineer’s direction.

2. Horn Strobe units: Furnish quantity equal to ten (10) percent of the number of units installed, but not less than one (1), plus 50 ft. of wire and conduit, installed at the Engineer’s direction.

3. Smoke Detectors or Sensors: Furnish quantity equal to ten (10) percent of the number installed, but not less than one (1) of each type, plus 50 ft. of wire and conduit, installed at the Engineer’s direction.

4. Detector or Sensor Base(s): Furnish quantity equal to ten (10) percent of the number of units of each type installed but not less than one (1) of each type, plus 50 ft. of wire and conduit, installed at the Engineer’s direction.

5. Addressable Circuit Interface Modules: Furnish quantity equal to ten (10) percent of the number of units installed, but not less than one (1), plus 50 ft. of wire and conduit, installed at the Engineer's direction.

PART 2 - PRODUCTS

2.1 Fire Alarm Control Panel (FACP)

A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."

B. The following FACP hardware shall be provided:

1. Power limited base panel with beige or red cabinet and door, 120VAC input power.
2. 250 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
3. 250 points of annunciation where one (1) point of annunciation equals:
    a) 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
    b) 1 LED on panel or 1 switch on panel.
4. One auxiliary relay, electronically resettable fused 2A @ 24 VDC, programmable as a trouble relay, either as normally energized or as an auxiliary control.
5. One auxiliary relay, SPDT 2A @ 32 VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
6. Where required, provide intelligent remote battery charger for charging up to 110Ah batteries.
7. Power supplies with integral intelligent Notification Appliance Circuit, Class B, for system expansion.
8. Four (4) form "C" Auxiliary Relay Circuits (form C contacts rated 2A @ 24 VDC. Resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to 1/2A @ 120 VAC, inductive.
9. The FACP shall support six (6) RS-232-C ports and one (1) service port.
10. Remote Unit Interface: Supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.

C. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.

D. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory and component status messages and shall include a keypad for use in entering and executing control commands.

E. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):

1. Voice and telephone control circuits.

2. Addressable Signaling Line Circuits.

3. Initiating Device Circuits.

4. Notification Appliance Circuits.

5. Auxiliary Control Circuits.

F. Fire Alarm Control Unit shall be capable of operating remote CRT's; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.

G. Fire Alarm Control Unit shall be capable of operating a PC Annunciator which provides status annunciation and limited system control using a convenient and familiar Microsoft Windows ™ 2010 operating system based interface. PC Annunciator shall provide the following functions:

1. Login/logout password protection with time duration selectable automatic logout.

2. Displays Alarm, Supervisory, Priority 2 and Trouble conditions with numerical tallies for each.

3. Displays first and last alarms.

4. Different event types have separate visible indicators with a common audible indicator.

5. Event logs can be searched and printed.

6. View and/or print True-Alarm status reports and service reports (printing requires an available local or network printer).

7. Alarm Silence; System Reset and Priority 2 Reset.

8. Global and individual point acknowledge

9. Set system time and date; and clear event log

10. Individual point access for control or parameter revisions

2.2 Remote LCD Annunciator

A. Provide Remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The remote LCD Annunciator shall use the same Primary Acknowledge, Silence and Reser Keys, Status LED's and LCD Display as the FACP. Simplex 4606-9101.

B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LED's.

C. Under normal conditions the LCD shall display a “SYSTEM IS NORMAL” message and the current time and date.

D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

E. The LCD shall display the following information relative to the abnormal condition of a point in the system:

1. 40 character custom location label

2. Type of device (e.g., smoke, pull station, waterflow).

3. Point status (e.g., alarm, trouble).

F. Operator keys shall be switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.3 Emergency Power Supply

A. General: Components include battery, charger and an automatic transfer switch.

B. Battery: Sealed lead-acid. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 15 minutes.

2.4 Addressable Manual Pull Stations (Simplex 4099-9003)

A. Description: Addressable single-action type, red LEXAN with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

B. Protective Shield: Where indicated on plans, provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85 dB at 10 feet and shall be powered by a 9 VDC battery.

2.5 Smoke Sensors (Simplex 4098-9714)

A. General: Comply with UL 268, “Smoke Detectors for Fire Protective Signaling Systems.” Include the following features:

1. Factory Nameplate: Serial number and type identification.

2. Operating Voltage: 24 VDC, nominal.

3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.

4. Plug-in Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

5. Each sensor base shall contain an LED that will flash each time it is scanned by the control unit (once every 4 seconds). In an alarm condition, the sensor base LED shall be on steady.

6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a “wrong device”, the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a “Wrong Device” trouble condition.

8. The sensor’s electronics shall be immune from false alarms caused by EMI and RFI.

9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.

10. Removal of the sensor head for cleaning shall not require the setting of the addresses.

B. Type: Smoke sensors shall be of the photoelectric or combination photoelectric/heat type.

C. Bases: Relay output, sounder and isolator bases be supported alternatives to the standard base. (Simplex 4098-9791).

D. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific size and installation conditions where applied. Sensor includes relay as required for fan shutdown. (Simplex 4098-9756).

1. Environmental compensation, programmable sensitivity settings, status testing and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.

2. The duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single “Form C” contact rated at 7A @ 28 VDC or 10A @ 120 VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.

3. Duct Housing shall provide a relay control trouble indicator Yellow LED. (Simplex 2088-9021).

4. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.

5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.

6. Duct Housing shall provide a magnetic test area and Red sensor status LED.

7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

8. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch (Simplex 2098-9806).

9. Where indicated, a NEMA 4X weatherproof duct housing enclosure shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.6 Heat Sensors (Simplex 4098-9733)

A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

B. Thermal sensor shall be of the epoxy encapsulated electronic design It shall be thermistor based, rate-compensated, self-restoring and shall not be affected by thermal lag.

C. Sensor fixed-temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.

D. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.7 CO Sensors

A. Ceiling mounted CO detectors shall be addressable with minimum 10 year CO cell with end of life warning.

2.8 Addressable Circuit Interface Modules (Simplex 4090-9001)

A. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices and for control of evacuation indicating appliances and HVAC systems.

B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include coverplates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two-wire pair running from an appropriate power supply as required. (Simplex 4090-9003).

C. There shall be the following types of modules:

1. Type 1: Monitor Circuit Interface Module:

a) For conventional 2-wire smoke detector and/or contact device monitoring with Class B wiring supervision. The supervision of the zone will be Class B. This module will communicate status (normal, alarm, trouble) to FACP.

b) For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.

2. Type 2: Line Powered Monitor Circuit Interface Module:

a) This type of module is an individually addressable module that has both its power and its communications supplied by the 2-wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

b) This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal and short). The 2-wire signaling line circuit shall supply power and communications to the module.

3. Type 3: Single Address Multi-Point Interface Modules:

a) This multipoint module shall provide location specific addressability for four initiating circuits and control two output relays from a single address. Inputs shall provide supervised monitoring of normally open, dry contacts and be capable of communicating four zone status

conditions (normal, open, current limited and short). The input circuits and output relay operation shall be controlled independently and disabled separately.

b) This dual point module shall provide a supervised multi-state input and a relay output, using a single address. The input shall provide supervised monitoring of two normally open, dry contacts with a single point and be capable of communicating four zone status conditions (normal, open, current limited and short). The 2-wire signaling line circuit shall supply power and communications to the module.

c) This dual point module shall monitor an unsupervised normally open, dry contact with one point and control an output relay with the other point, using a single address. The 2-wire signaling line circuit shall supply power and communications to the module.

4. Type 4: Line Powered Control Circuit Interface Module:

a) This module shall provide control and status tracking of a Form “C” contact. The 2-wire signaling line circuit shall supply power and communications to the module.

D. All circuit interface modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LED’s shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.9 Magnetic Door Holders

A. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall operate from a 24 VDC source and develop a minimum of 25 lbs. holding force.

B. Material and Finish: Match door hardware.

2.10 Standard Alarm Notification Appliances

A. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4” square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with flash intensity of 15 to 110 Cd, depending on spacing and location to comply with NFPA 72. Provide a label inside the strobe lens to indicate the candela rating setting of the specific appliance.

B. Horn/Visible: Combination Horn/Visible (H/V) units combine the horn and visible functions into a common housing. The H/V shall be listed to UL 1971 and UL 464. (Simplex 4903-Series).

1. Twisted/shielded wire is required for speaker connections on a standard 25 VRMS or NAC; and UTP conductors, having a minimum of 3 twists per foot, is required for addressable strobe connections.

2. The following horn shall have a minimum UL rated SPL of 84 dBA at 10 feet.

3. The H/V shall install directly to a 4” square, 1 1/2 in. deep electrical box with 1 1/2 in. extension.

4. Provide a wireguard on units subject to impact, Gymnasium Exterior Units and Mechanical Rooms. (Simplex 4905-9961).

C. Horn: Horn notification appliances shall be listed to UL 464. (Simplex 4903-Series).

1. The horn shall operate on a standard NAC using twisted/shielded wire.

2. The horn shall have a minimum UL rated SPL of 84 dBA at 10 feet.

3. The horn shall install directly to a 4” square, 1 1/2 in. deep electrical box with 1 1/2 in. extension.

D. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with an On Steady operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided. All building strobes shall be synchronized to each other.

E. Ceiling mounted notification devices may be utilized, where accepted by the AHJ.

F. Accessories: The contractor shall furnish the necessary accessories.

2.11 NAC Power Extender (Simplex 4009)

A. The IDNet NAC Power Extender panel shall be a stand-alone panel capable of powering a minimum of 4 notification appliance circuits. Notification appliance circuits shall be Class B Style Y rated at 2 amps each.

B. The internal power supply and battery charger shall be capable of charging up to 12.7 Ah batteries internally mounted or 18 Ah batteries mounted in an external cabinet.

C. The NAC extender panel may be mounted close to the host control panel or can be remotely located. The IDNet Addressable NAC Extender Panel, when connected to an addressable panel,

shall connect to the host panel via an IDNet communications channel. Via the IDNet channel, each output NAC can be individually controlled for general alarm or selective area notification.

D. For IDNet connected NAC extender panels, up to five (5) panels can be connected on a single IDNet channel.

E. When connected to a conventional (non-addressable) panel, one or two standard notification appliance circuits from the main control panel may be used to activate all the circuits on the NAC power extender panel.

F. Alarms from the host fire panel shall signal the NAC power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.

PART 3 - EXECUTION

3.1 Installation, General

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:

1. Factory trained and certified personnel.

2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.

3. Personnel licensed or certified by state or local authority.

3.2 Equipment Installation

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes and all other necessary material for a complete operating system.

B. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.

C. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

3.3 Wiring Installation

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electrical Code (NEC).

B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

C. Color Coding: Color code fire alarm conductors red. Paint fire alarm system junction boxes and box covers red.

D. The following wiring and conduit shall also be included in the fire alarm system work:

1. Wiring to supervisory monitor and control points.

3.4 Field Quality Control

A. Manufacturer’s Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing and adjustment of the system.

B. Service personnel shall be qualified and experienced in the inspection, testing and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:

1. Factory trained and certified personnel.

2. National Institute of Certification in Engineering Technologies (NICET) fire alarm certified.

3. International Municipal Signal Association (IMSA) fire alarm certified.

4. Certified by state or local authority.

5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

C. Pre-testing: Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests and detailed test results in the form of a test log.

H. Final Test, Certificate of Completion and Certificate of Occupancy:

1. Test the system as required by the Authority Having Jurisdiction (AHJ) in order to obtain a certificate of occupancy.

3.5 Cleaning and Adjusting

A. Cleaning: Remove paint splatters and other spots, dirt and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Test fire-alarm system for compliance with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections. Provide up to three (3) visits to the site for this purpose.

3.6 Training

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner’s maintenance personnel for a minimum of 4 hours training on-site.

END OF SECTION 26 6103

SECTION 26 7533 - RACEWAY AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for communications systems including voice, data, fire alarm and other remote-control, signaling and power-limited circuit systems.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, cable trays, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Comply with ANSI/EIA/TIA 569.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel only, set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Single-gang deep box for wall-phone, minimum two-gang box with single-gang extension ring for all others.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Mechanical rooms below 18 inches AFF

4. Concealed in Ceilings and Interior Walls and Partitions: EMT except FMC may be utilized in existing walls.
5. Damp or Wet Locations: Rigid steel conduit.

6. Raceways for Optical Fiber or Communications Cable: EMT.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Install no more than the equivalent of two 90-degree bends in any conduit run or .

F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

I. Raceways for Data, Audio Visual and Communications Cable: Install as follows:

1. 1-Inch Trade Size and Smaller: Install raceways in maximum lengths of 75 feet.
2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

3. Raceway shall be installed continuously from outlet box to above edge of nearest cable tray above accessible ceiling.

4. Bond raceway to cable tray with approved grounding bushing, bonding jumper and necessary fittings.

J. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in all locations except MC may be used for lighting fixture whips.

K. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

L. Set metal floor boxes level and flush with finished floor surface.

3.3 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Manual gates with related hardware.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2022).

C. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.

D. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

E. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

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. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Line Posts: 1.9 inch (48 mm) diameter.

B. Corner and Terminal Posts: 2.38 inch (60 mm) diameter.

C. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 6 gauge, 0.1920 inch (4.9 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.

D. Fabric with Pre-Inserted Slats: 2 inch (51 mm) diamond mesh interwoven wire, 6 gauge, 0.1920 inch (4.9 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.
   1. Privacy Slats: High-density polyethylene (HDPE), woven into fabric.
      a. Visual Barrier: 95 percent.
      b. Slat Color: Selected from manufacturer's standard line.

E. Tension Wire: 6 gauge, 0.1920 inch (4.9 mm) thick steel, single strand.

F. Tie Wire: Aluminum alloy steel wire.

2.02 MATERIALS

A. Posts, Rails, and Frames: _____:
   1. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   2. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric: _____:
   1. ASTM A392 zinc coated steel chain link fabric.

2.03 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1,525 mm) high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Hinges: Finished to match fence components.

C. Latches: Finished to match fence components.
   1. Provide padlock hasp on gates. Padlock provided by Owner.

2.04 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Privacy Slats: High-density polyethylene (HDPE) strips, sized to fit fabric weave.

2.05 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot (530 g/sq m).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris and _____.

3.02 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Install center brace rail on corner gate leaves.

G. Do not stretch fabric until concrete foundation has cured 28 days.

H. Position bottom of fabric 2 inches (50 mm) above finished grade.

I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches (380 mm) on centers.

J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

K. Install bottom tension wire stretched taut between terminal posts.

L. Do not attach the hinged side of gate to building wall; provide gate posts.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm).

B. Maximum Offset From True Position: 1 inch (25 mm).

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

3.05 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

END OF SECTION